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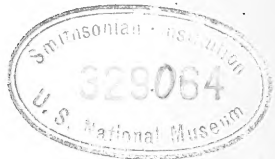
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ERRATA.

Vol. X. Page 60, line 5.—Read “ 16,000 ” instead of “ 18,000.”

Page 61, line 24.—Read “ *they all stopped and turned to look,*” instead of “ they all started and went to look.”

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Heeckerenez, LeBaron Von (Hon. Corresp. Member)Java.
Henderson, Surg.-Capt. R. S. F.Deesa.
Henderson, Surg.-Major W. G. H.Hyderabad, Sind.
Herbert, Surg.-Capt. H.Bombay.
Hibbert, Capt. E.Europe.
Hibbert, Col. J.Europe.
Hickman, R. St. J.Cachar.
Hight, Mrs.Nasik.
Hildebrand, Lt. A. B. R. (R.E.)Bombay.
Hill, F. J. A.Bombay.
Hill, H. CharlesEurope.
Hla, Maung PoMingin, Burma.
Hodges, Capt. H.Kendat, Burma.
Hodgson, C. M.Belgaum.
Hojel, Surg.-Capt. A. G.Bombay.
Hole, H. A.Silchar.
Holland, W. J.Bijapur.
Hollis, T.Bombay.
Hooton, Surg. Lt. A.Poona.
Hope, G. A. (R.A.)Ellichpur.
Hore, Lt.-Col. W. S.Europe.
Hornidge, S. (C.E.)Ahmednagar.
Howes, MowbraySelangore.
Howlett, Col. A. (I.S.C.)Mandalay.
Howse, G. E.Bombay.
Hudson, C. W. M. (I.C.S.)Bandra.
Hudson, L. S.Bombay.
Hunter, H. C. V.Europe.
Hunter, Lt.-Col. J. M.Rajkote.
Hunter, Capt. W. H.Nagpur.
Hurkisonadas NurrotamdasBombay.

Hussey, Col. C. E. ...	...	...	...<i>Europe.</i>
Hutchinson, Lieut. C. R. M. ...	...	...	...Bakloh.
Hutchinson, F. T. ...	...	...	...Bombay.
Hyam, Judah (Life Member) ...	...	...	...Poona.
Imray, Robt. S. ...	...	...	...Peermaad, Travancore.
Indore, H. H. the Maharaja Holkar of ...	...	...	...Indore.
Inglis, Chas. M. ...	...	...	...Darbhanga.
Inverarity, J. D. (Life Member) ...	...	...	...Bombay.
Israel, Shalom Bapujee ...	...	...	...Murud, Janjira.
Jackson, Col. F. H. ...	...	...	...Palanpur.
Jacob, G. (I.C.S.) ...	...	...	...Sholapur.
Jacob, H. S. ...	...	...	...Munmar.
James, H. E. M. (I.C.S.) ...	...	...	...Karachi.
Jameson, Surg.-Capt. J. B. ...	...	...	...Poona.
Jamrach, W. ...	...	...	...<i>Europe.</i>
Jamsetji, M. Doctor ...	...	...	...Bombay.
Jardine, A. J. A. ...	...	...	...Burma.
Jardine, E. R. ...	...	...	...<i>Europe.</i>
Jardine, James ...	...	...	...<i>Europe.</i>
Jardine, Mrs. John... ..	...	...	...<i>Europe.</i>
Jardine, W. F. ...	...	...	...Uran.
Jayakar, Surg.-Lt.-Col. A. S. G. ...	...	...	...Muscat.
Jejeebhoy, Sir Jamsetjee (Bart.) ...	...	...	...Bombay.
Jaffery, J. A. ...	...	...	...Bombay.
Jennings, Capt. A... ..	...	...	...<i>Europe.</i>
John, H. E. ...	...	...	...Bombay.
Johnson, J. R. Kirby ...	...	...	...<i>Europe.</i>
Johnson, S. M. ...	...	...	...Cawnpore.
Jones, Surg.-Capt. F. W. C... ..	...	...	...Mhow, C. I.
Jones, Lieut. M. D. Goring ...	...	...	...<i>Europe.</i>
Jugmohundas V. Bhaisett ...	...	...	...Bombay.
Kaliandas Keshavdas ...	...	...	...Bombay.
Kay, Dr. W. ...	...	...	...<i>Europe.</i>
Kazi Sahabudin, Khan Bahadur (C.I.E.) ...	...	...	...Poona.
Kearns, A. S. ...	...	...	...Masulipatam.
Keatinge, G. (I.C.S.) ...	...	...	...Dharwar.
Keary, Lt.-Col. H. D. ...	...	...	...Burma.
Kemball, H. V. (C.E.) ...	...	...	...Jacobabad.
Kennedy, Major W. P. ...	...	...	...Navanagar.
Kennedy, H. E. Rear-Admiral W. R. ...	...	...	...<i>Europe.</i>
Kennedy, R. ...	...	...	...Bombay.
Kenyon, James ...	...	...	...<i>Europe.</i>
Ker, L. B. ...	...	...	...<i>Europe.</i>
Kerkhoven, E. J. (Hon. Correspg. Member) ...	...	...	...Java.
Keys, H. W. ...	...	...	...Dhulia.

Khan, Muncherji Framji	...	...	...Bombay.
Khareghat, M. P. (I.C.S.)	...	...	...Ratnagiri.
King, Alfred	...	...	...Europe.
Kinloch, A. M.	...	...	...Kotagiri.
Kinsman, F.	...	...	...Calcutta.
Kirtikar, Surg.-Major K. R.	...	...	...Thana.
Knight, D.	...	...	...Cawnpore.
Kolhapur, H. H. the Maharaja of (Life Member)	...	...	...Kolhapur.
Kotah, H. H. the Maharaja	...	...	...Kotah.
Kunwar Kushal Pal Singh	...	...	...Narki.
Lamb, R. A. (I.C.S.) (Life Member)	...	...	...Poona.
Lambert, R. M.	...	...	...Hyderabad.
Land Records and Agriculture, The Director of	...	...	...Poona.
Landon, H. J. (I.C.S.)	...	...	...Poona.
Lang, F.	...	...	...Europe.
Lang, Walter	...	...	...Bombay.
Langley, Brig.-Surg. E. H.	...	...	...Europe.
Lathi, H. H. the Thakore Sahib of	...	...	...Lathi.
La Touche, Major-General	...	...	...Europe.
La Touche, C. B.	...	...	...Delhi.
Lawder, Dr. E. J.	...	...	...Hyderabad.
Leask, J.	...	...	...Bombay.
Lee, Lieut. A. W. H.	...	...	...Rangoon.
Lee, P. Henry K.	...	...	...Mysore.
Lees, John	...	...	...Cachar.
Lees, R. C.	...	...	...Bombay.
Lee-Warner, W. (I.C.S., C.S.I.)	...	...	...Europe.
Leggett, S. P.	...	...	...Karachi.
Lely, F. S. P. (I.C.S.)	...	...	...Ahmedabad.
Leslie, A. K.	...	...	...Europe.
Lester, Lt. C. D.	...	...	...Cutch.
Leville, Rev. H.	...	...	...Europe.
Light, Major R. H.	...	...	...Bhuj, Cutch.
Light, Lieut. W. A.	...	...	...Poona.
Lindesay, Major E.	...	...	...Saugor, C. P.
Lingard, Dr. Alfred	...	...	...Europe.
Linnell, Fred.	...	...	...Seoni.
Little, F. A.	...	...	...Europe.
Little, Hon'ble Mr. T. D. (C.E.)	...	...	...Europe.
Littledale, Professor H.	...	...	...Baroda.
Loam, Mathew	...	...	...Coimbatore, Madras.
Loch, Col. W. W.	...	...	...Bhurtpur.
Logan, R. (I.C.S.)	...	...	...Europe.
Long, A. M.	...	...	...Tura, Assam.
Long, G. R. (Life Member)	...	...	...Moulmein.
Lord, J. P.	...	...	...Surat.
Lovell, E. C. T.	...	...	...Colombo.

Lowdell, Surg.-Major C. G. W.	...	...	...Nasik.
Lowndes, G. R.	...	...	...Bombay.
Lowrie, A. E.	...	...	...Chanda, C. P.
Luard, E. S.	...	...	...Bombay.
Lucknow, The Curator & Sec., Provincial Museum.	...	...	...Lucknow.
Lye, Rev. S. L.	...	...	...Bombay.
Lynch, C. B.	...	...	...Europe.
Lynn, G. R. (C.E.)	...	...	...Baroda.
Macaulay, Capt. K.	...	...	...Bombay.
Macaulay, R. H.	...	...	...Bombay.
Macaulay, W. M.	...	...	...Bombay.
MacCartie, Surg.-Major F.	...	...	...Bombay.
MacDonald, Dr. D. (Life Member)	...	...	...Bombay.
MacDonald, J.	...	...	...Bombay.
Mackenzie, J. Muir (I.C.S.)	...	...	...Poona.
Mackenzie, Col. K.	...	...	...Europe.
Mackenzie, M. D.	...	...	...Karachi.
Mackenzie, Hon'ble Mr. T. D. (I.C.S.)	...	...	...Europe.
Mackinnon, P. W. (F.E.S.)	...	...	...Mussooree.
Maclea, Jas.	...	...	...China.
Macleod, N. C.	...	...	...Bombay.
Maconachie, Brig.-Surg.-Lt.-Col. G. A.Europe.
Macpherson, JohnBombay.
Macpherson, Col. T. R. M.Europe.
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Madden, Lieut. T. E.Silchar.
Madras, The Supt., Govt. Central MuseumMadras.
Mahaluxmiwalla, K. D.Bombay.
Mainwaring, H.	...	...	...Europe.
Mair, A.	...	...	...Bombay.
Mallins, Surg.-Major C.	...	...	...Madras.
Maneckshaw D. Doctor	...	...	...Bombay.
Manson, F. B.	...	...	...Darjiling.
Mant, R. N.	...	...	...Bombay.
Maries, Chas. (Hon. Correspg. Member)	...	...	...Gwalior.
Marston, G. D. (C.E.)	...	...	...Sholapur.
Marten, James	...	...	...Raipur, C. P.
Martin, Lieut.-Col. Gerald (Life Member)	...	...	...Bombay.
Mason, Geo. E.	...	...	...Europe.
Masson, D. P.	...	...	...Lahore.
Mathew, Surg.-Lt. C. M.	...	...	...Quilon.
Maynard, J. C. P. (C.E.)	...	...	...Bandora.
McArthur, Vet.-Surgeon G. W.	...	...	...Rangoon.
McCabe, R. B. (I.C.S.)	...	...	...Kamrup, Assam.
McClelland, W. S. (M.I.C.E.)	...	...	...Europe.
McIntosh, H. J. (I.C.S.)	...	...	...Bhagalpur.
McKay, Surg. Lt.-Col. H. K.	...	...	...Jabalpur, C. P.

McKee, J. A.	...	...	...	...Nagpur, C. P.
McKenzie, Alex.	...	...	...	...Bombay.
McMullen, Dr. G. C.	...	...	...	...Kotri.
McNeil, J. (I.C.S.)	...	...	...	...Bombay.
Mead, Capt. H. R.	...	...	...	...Deolali.
Mead, P. J. (I.C.S.)	...	...	...	...Ahmedabad.
Meade, Major M. J.	...	...	...	...Bushire
Mercer, Frank	...	...	...	...Bareilly.
Meredith, Richard	...	...	...	...Lahore.
Messent, P. G.	...	...	...	...Bombay.
Meyer, Surg.-Capt. C. H. L.	...	...	...	...Europe.
Meyer, O.	...	...	...	...Bombay.
Middleton, T. H.	...	...	...	...Europe.
Millard, W. S.	...	...	...	...Europe.
Miller, E.	...	...	...	...Europe.
Millett, G. P.	...	...	...	...Thana.
Mills, Vet.-Major Jas.	...	...	...	...Bombay.
Minniken, G. G.	...	...	...	...Kilba, <i>viâ</i> Simla.
Modi, Bomanji Edulji	...	...	...	...Kaira.
Moir, E. McArthur	...	...	...	...Chakrata.
Monk, Capt. P. R.	...	...	...	...Europe.
Monks, Surg.-Major C.	...	...	...	...Mahableshwar.
Monro, A. V.	...	...	...	...Lahore.
Monté, Dr. A. de	...	...	...	...Bandora.
Monté, Rev. Dr. B. de	...	...	...	...Mahim.
Moon, A. J.	...	...	...	...Kunkumbi, Bel- gaum Dist.
Morgan, A.	...	...	...	...Kotagiri.
Morres, J. L.	...	...	...	...Poona.
Morris, D.	...	...	...	...Bombay.
Morris, Lieut. D. O.	...	...	...	...Khamgaon.
Morton, Surg.-Lieut. J. P.	...	...	...	...Madras.
Moscardi, E. H. (I.C.S.)	...	...	...	...Europe.
Moultrie, J. E.	...	...	...	...Pannyde, Lower Burma.
Moulvi Syed Ali Belgram	...	...	...	...Hyderabad.
Moylan, W.	...	...	...	...Haflong, Cachar.
Muir, Frank	...	...	...	...Jhansi.
Muir, Surg.-Col. H. S.	...	...	...	...Europe.
Muller, Professor O. V.	...	...	...	...Bombay.
Mure, J. S.	...	...	...	...Lahore.
Murray, W.	...	...	...	...Bombay.
Nagpur, The Curator, Central Museum	...	...	...	...Nagpur.
Nairne, Rev. A. K. (Hon. Correspg. Member)	...	...	...	...Europe.
Nangle, Lieut. K. E.	...	...	...	...Elliehpur.
Naranji Dwarkadas (Life Member)	...	...	...	...Bombay.
Narrotundas Morarji Goculdass (Life Member)	...	...	...	...Bombay.
Navanagar, H. H. Maharaja Jam Sahab of	...	...	...	...Rajkote.

Nawab Mahomed Salamullakhan, Khan Bahadur	...	...	...Buldana, Berars.
Newman, Surg.-Col. J. H.	...	...	...Nagpur, C. P.
Newnham, Capt. A. (F.Z.S.)	...	...	...Europe.
Nicéville, L. de (Hon. Correspg. Member)	...	...	...Calcutta.
Nicholls, G. Jasper (I.C.S.)	...	...	...Moradabad.
Nicholson, E. F.	...	...	...Bombay.
Nicholson, Capt. J. S.	...	...	...Natal.
Nicholson, Surg.-Major R. H.	...	...	...Nowgong.
Nisbett, Lieut. W. G.	...	...	...Fort Stedman.
Nurse, Lieut. H. H.	...	...	...Bombay.
Oakes, George	...	...	...Ootacamund.
Oates, E. W. (Hon. Correspg. Member)	...	...	...Europe.
O'Brien, Hon'ble W. T.	...	...	...Karachi.
O'Callaghan, I.	...	...	...Bombay.
O'Connell, J.	...	...	...Europe.
O'Connor, J. E. (C.I.E.)	...	...	...Calcutta.
Oldham, F. T.	...	...	...Kamptee, C. P.
Olivier, Lt.-Col. H. D. (R.E.) (Life Member)	...	...	...Bombay.
Ollivant, The Hon'ble Sir E. C. K.	...	...	...Bombay.
Ommanney, D. G.	...	...	...Thana.
Ommanney, H. T. (I.C.S.)	...	...	...Europe.
Opiumwalla, Dorab E.	...	...	...Bombay.
Ormiston, Geo. E. (C.E.)	...	...	...Europe.
Orr, J. P.	...	...	...Poona.
Orr, Col. W. J.	...	...	...Karachi.
Osman, C. W.	...	...	...Europe.
Osmaston, B. B.	...	...	...Dehra Dun.
Osmaston, L. S.	...	...	...Poona.
Owen, R. R.	...	...	...Europe.
Owen, W. S.	...	...	...Europe.
Ozanne, E. C. (I.C.S.)	...	...	...Europe.
Palliser, H. G. (C.E.)	...	...	...Belgaum.
Pandurang Gopal, Dr.	...	...	...Bombay.
Parker, Surg.-Major J.	...	...	...Bombay.
Parmenides, John	...	...	...Europe.
Parsons, Hon. Mr. Justice	...	...	...Bombay.
Partridge, Henry (Life Member)	...	...	...Pyinmana, Burma.
Pawalla, Jamsetji C.	...	...	...Bombay.
Pearse, Surg.-Capt. A.	...	...	...Darjiling.
Pearson, E. H. M.	...	...	...Europe.
Pearson, Mrs. H. C.	...	...	...Bhaynder.
Pease, Vet.-Capt. H. T.	...	...	...Simla.
Pechey-Phipson, Mrs. (M.D.)	...	...	...Europe.
Peddie, M. G.	...	...	...Nowgong.
Peet, A. W.Vizagapatam.
Peile, Lieut. A. J. (R.A.)Bombay.
Pemberton, E. S.Europe.

LIST OF MEMBERS.

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Pennington, R. W. R.Bombay.
Pentland, Major R. C.Natal.
Penton, John E.Ratnagiri.
Pestonji JivanjiHyderabad.
Peters, Surg.-Lt.-Col. C. T.	...	...	...Belgaum.
Petit, Bomanji Dinshaw (Life Member)	...	...	...Bombay.
Petit, Jehangir Bomanji (Life Member)	...	...	...Bombay.
Phillips, Mrs.	...	...	...Assam.
Philpott, C. C.	...	...	...Europe.
Phipson, H. M. (C.M.Z.S.) (Life Member)	...	...	...Bombay.
Filcher, Capt. A. J. (R.E.)	...	...	...Bangalore.
Filcher, Surg.-Col. J. G.	...	...	...Dilkusha, Oudh.
Pinhey, Capt. A. F.	...	...	...Sutna.
Place, G.	...	...	...Akyab, Burma.
Plinston, G. C.	...	...	...Bombay.
Pollen, Dr. John (I.C.S.)	...	...	...Europe.
Poncins, Baron Edmond de (Life Member)	...	...	...Europe.
Poore, Capt. R. M.	...	...	...Natal.
Pope, P. J. (I.C.S.)	...	...	...Mangalore.
Porter, W. M.	...	...	...Pegu, Burma.
Prain, Surg.-Capt. D.	...	...	...Calcutta.
Prall, Surg.-Capt. S. E.	...	...	...Bandra.
Pratt, E. M. (I.C.S.)	...	...	...Sholapur.
Preston, F. J.	...	...	...Hurda, C. P.
Prior, Capt. H. M.	...	...	...Calcutta.
Prior, Capt. W.	...	...	...Fyzabad.
Proctor, H. E.	...	...	...Bombay.
Pyrke, Capt. R. D.	...	...	...Europe.
Quicke, Surg.-Major W. H.	...	...	...Europe.
Rahimtoola Khairaz	...	...	...Bombay.
Raikes, E. B.	...	...	...Bombay.
Rajpipla State, The Administrator of the	...	...	...Nandod.
Rambant, B. R. R. (R.A.)	...	...	...Karachi.
Rand, W. C. (I.C.S.)	...	...	...Surat.
Rattray, Lieut. H. B.	...	...	...Malakand, Punjab.
Rattray, Major R. H.	...	...	...Jhelum.
Rayment, Vet.-Major G. J.	...	...	...Rawal Pindi.
Readymoney, N. J.	...	...	...Bombay.
Reddie, F. A.	...	...	...Bombay.
Rees, J. C. (C.E.)	...	...	...Pegu, Burma.
Reeve, R.	...	...	...Bombay.
Reid, G. B. (I.C.S.)	...	...	...Europe.
Renton, Lieut. C. C.	...	...	...Julina.
Reynolds, P. (C.E.)	...	...	...Bombay.
Rhodes, T. M.	...	...	...Haflong, Cachar.
Richardson, Cecil	...	...	...Bombay.
Richardson, Major W. St. John	...	...	...Rawal Pindi.

Ritchie, A. M.	...	...	...	...Kairā.
Rivett-Carnac, J.	...	...	...	...Cachar.
Rivett-Carnac, L.	...	...	...	...Europe.
Robb, Surg.-Major John (M.D.)	...	...	...	...Europe.
Roberts, R.	...	...	...	...Secunderabad.
Roberts, T. L.	...	...	...	...Bombay.
Robertson, B. (I.C.S.)	...	...	...	...Seoni, Chapara.
Robertson, Col. D.	...	...	...	...Mysore.
Robinson, Mrs.	...	...	...	...Europe.
Robinson, Lieut. G. T.	...	...	...	...Rawal Pindi.
Roffey, S. H.	...	...	...	...Mysore.
Rodon, Major G. S.	...	...	...	...Dharwar.
Rodonachie, Ambrose	...	...	...	...Europe.
Rogers, C. G.	...	...	...	...Europe.
Rogers, Henry (M.R.C.V.S.)	...	...	...	...Bombay.
Rogers, Thos.	...	...	...	...Bombay.
Rome, F. J.	...	...	...	...Bombay.
Roorkee, The Principal, Thomason College	...	...	...	...Rurki.
Roosmale Cocq, Chas. H.	...	...	...	...Satara.
Rundle, Surg.-Major C. S.	...	...	...	...Thayetmyo, Burma.
Russell, L. P.	...	...	...	...Bombay.
Rustomjee, H. J.	...	...	...	...Karachi.
Rutherford, D.	...	...	...	...Larkhana.
Ryder, Capt. W. J.	...	...	...	...Dharanasala.
Ryland, E. C.	...	...	...	...Calcutta.
Ryves, A. E.	...	...	...	...Allahabad.
Sada, Monsieur A.	...	...	...	...Europe.
Sandhurst, H. E. Lord	...	...	...	...Poona.
Sanjeli, Prince Kumar Shri Ranjit Singh	...	...	...	...Poona.
Saone, G. Prier De...	...	...	...	...Bombay.
Sargent, H. G. F.	...	...	...	...Deesa.
Sassoon, Mrs. S. D.	...	...	...	...Bombay.
Saunders, Lt. F. W. (R.E.)	...	...	...	...Secunderabad.
Savile, P. B.	...	...	...	...Bombay.
Scindia, H. H. the Maharaja (Life Member)	...	...	...	...Gwalior.
Scott, Lieut. E. W. W.	...	...	...	...Egypt.
Scott, M. H. (I.C.S.)	...	...	...	...Europe.
Seal, Dr. C. E.	...	...	...	...Darjiling.
Selby, Col. H. O. (R.E.)	...	...	...	...Bombay.
Sellick, Surg.-Capt. J. H.	...	...	...	...Myingyan, Burma.
Seervai, Rustom F.	...	...	...	...Bombay.
Sewell, Major J. H.	...	...	...	...Allahabad.
Sewell, R. A. D.	...	...	...	...Europe.
Sharp, Professor W. H.	...	...	...	...Bombay.
Sharpe, Genl. C. F.	...	...	...	...Saharanpur.
Shaw, F. W.	...	...	...	...Bombay.
Shelley, Lt. Bertram A. G. (R.E.)	...	...	...	...Madras.
Sheppard, W. D. (I.C.S.)	...	...	...	...Bijapur.

Shipp, W. (C.E.)	...	...	...Jabalpur.
Shipp, W. E.	...	...	...Ajmir.
Shopland, Capt. E. R.	...	...	...Europe.
Shoubridge, H. O. B.	...	...	...Jacobabad.
Shuttleworth, A. E.	...	...	...Mekockchund.
Silcock, H. F. (I.C.S.)	...	...	...Nasik.
Simkins, A. R. M.	...	...	...Europe.
Simpson, A. F.	...	...	...Bombay.
Simpson, J. Hope (I.C.S.)	...	...	...Jhansi.
Sims, E. Proctor	...	...	...Jamnagar.
Sims, R. Proctor	...	...	...Bhavnagar.
Sinclair, W. F. (I.C.S.) (Life Member)	...	...	...Europe.
Skey, Capt. F. E. G. (R.E.)	...	...	...Rurki.
Slade, H.	...	...	...Bangkok, Siam.
Sladen, J. (I.C.S.)	...	...	...Shewan, Karachi.
Slater, D. McLauchlan	...	...	...Bombay.
Slater, E. M.	...	...	...Bombay.
Slater, J. Sanders	...	...	...Bombay.
Sly, F. G. (I.C.S.)	...	...	...Calcutta.
Smale, Chas. B.	...	...	...Magwe, Burma.
Smetham, E. R.	...	...	...Bombay.
Smith, Capt. S. C.	...	...	...Europe.
Smith, Major Stanley	...	...	...Bombay.
Smith, Mrs. Yorke	...	...	...Europe.
Smyth, R. Bateman	...	...	...Europe.
Smythies, Arthur	...	...	...Mandalay.
Snuggs, J. F.	...	...	...Harda, C. P.
Spalding, C. S.	...	...	...Bhavnagar.
Span, Lt. H. J. B.	...	...	...Trimulgherry.
Spence, L. H.	...	...	...Shikarpur.
Spencer, F. A.	...	...	...Bombay.
Spooner, T. J. (C.E.)	...	...	...Dhola, Kathiawar.
Spurrell, Major R. J.	...	...	...Muttra.
Spragge, Miss E. E.	...	...	...Poona.
Sprague, Surg.-Capt. W. C.	...	...	...Karwar.
Squire, W. W. (C.E.)	...	...	...Bombay.
Squires, Mrs. R. A.	...	...	...Europe.
Stanton, W. C.	...	...	...Rangoon.
Starling, The Hon'ble Mr. M. H.	...	...	...Bombay.
Stebbing, E. P.	...	...	...Kalimpong, Bengal.
Steele, F. J.	...	...	...Rema.
Sterndale, H. C.	...	...	...Jalpaiguri.
Stewart, R. B. (I.C.S.)	...	...	...Nasik.
Stiven, J.	...	...	...Bombay.
Storey, Thos. H.	...	...	...Oodeypur.
Sturrock, G. C. (R.A.)	...	...	...Europe.
Sullivan, Col. G. D. F.	...	...	...Rawal Pindi.
Summers, Thos. (C.E.)	...	...	...Hyderabad, Sind.
Sutherland, J. (C.E.)	...	...	...Maymyo, Burma.

Sutherland, W.Rangoon.
Sutton, F. H.Bombay.
Swan, H. H.Bombay.
Swinhoe, Col. C.Europe.
Syers, Capt. H. C.Europe.
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Symington, J. H.Bombay.
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Symons, H. S.Europe.
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Tata, Dorabji J. (Life Member)Bombay.
Tata, Jamsetji N. (J.R.)Bombay.
Taylor, James H.Khorda, Orissa.
Taylor, M. D.Kumargram.
Taylor, R. H. BentleyMangalore.
Taylor, W. C.Khorda, Orissa.
Tejpal, Goverdhundas Goculdas (Life Member)Bombay.
Temulji B. Nariman, Dr.Bombay.
Tenasserim Agri-Horticultural Society, The Hony.				
Secretary of theMoulmein.
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Thacker, E. B.Bombay.
Thacker, W.Bombay.
Thatcher, Capt. J. F. C.Bombay.
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Thompson, H. M.Poona.
Thompson, H. N. (F.Z.S.)Monywa, Burma.
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Tighe, Capt. M. J.Hyderabad, Sind.
Tilly, T. H. (Life Member)Mingin, Burma.
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Tooth, E.Bombay.
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Traill, W. H.Europe.
Trapmann, A. G. (C.E.)Europe.
Travers, C. H.Europe.
Trevithick, R. L. (A.M.I.C.E.)Bombay.

Trevor, Hon'ble Mr. A. C.	...	...	...Simla.
Trewby, Miss Lilian (M.D.)	...	...	...Amraoti.
Trivandrum, Hon. Sec., Government Museum and Public Gardens	...	...	...Trivandrum.
Trotter, F. W. D.	...	...	...Silchar.
Troup, N. F. T.	...	...	...Kumaon.
Truninger, L.	...	...	...Rawal Pindi.
Tudball, W. (I.C.S.)	...	...	...Pilibhit.
Tufnell, Capt. H. R.	...	...	...Europe.
Turner, Mrs. A. F.	...	...	...Bombay.
Turner, A. W.	...	...	...Europe.
Turner, M. C.	...	...	...Calcutta.
Twopenny, C. D.	...	...	...Europe.
Uloth, H. W.	...	...	...Europe.
Ulwar, H. H. Maharaja Jey Singh of (Life Member)	...	...	...Ulwar.
Uniacke, Lt. N. F.	...	...	...Secunderabad.
Unwalla, J. N. (Life Member)	...	...	...Bhavnagar.
Vaidya, Dr. Poput Prabhuram	...	...	...Bombay.
Vanderzee, J. H.	...	...	...Sadon, Burma.
Varley, F. J. (I.C.S.)	...	...	...Dhulia.
Vaughan, Surg.-Capt. J. C. S.	...	...	...Burdwan.
Vidal, Hon'ble Mr. G. W. (I.C.S.)	...	...	...Europe.
Viccaji, Framji R. (Life Member)Bombay.
Vincent, Lieut. F. L.Fort Sandeman.
Vincent, W. H. H. (I.C.S.)Khulna.
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Waddington, C. W.Rajkote.
Walker, A. C.Europe.
Wall, Surg.-Lt. F.Trichinopoly.
Wallace, John (C.E.)Bombay.
Wallace, F. L.	...	...	...Bombay.
Wallace, L. A.	...	...	...Europe.
Wallinger, W. A.	...	...	...Godhra.
Wapshare, H.	...	...	...Hope, Guynd.
Ward, Lieut. C. H.	...	...	...Dinapur.
Ward, T. J.	...	...	...Bombay.
Warneford, Lt. G.	...	...	...Manipur.
Wasey, G. K.	...	...	...Europe.
Waterfield, Lieut. B. (I.S.C.)	...	...	...Mianwali, Punjab.
Watson, Capt. E. Y. (Life Member)	...	...	...Madras.
Watson, Capt. John C.	...	...	...Europe.
Webb, Wm.	...	...	...Bombay.
Weir, Surg.-Lieut.-Col. T. S.	...	...	...Bombay.
Wells-Cole, Capt. H.Nusseerabad.
Welsh, F. T.Bombay.
Welter, F.Europe.

Wenden, H. (C.E.)Europe.
Westall, J.Europe.
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Whateley, RichardBroach.
Whiffin, F. D.Singhboon.
Whitcombe, Surg.-Capt. E. G. R.Jacobabad.
White, W. H. (C.E.)	...	...	...Morvi, Kathiawar.
Whitehead, Lt. J. H.	...	...	...Mandalay.
Whiting, J. E. (C.E.)	...	...	...Poona.
Whitly, A. W.	...	...	...Europe.
Whittle, A. T.	...	...	...Wadhwan.
Whitworth, G. C. (I.C.S.) (Life Member)	...	...	...Karachi.
Whyte, Capt. C. W. F.	...	...	...Bhuji.
Wickham, P. F.	...	...	...Burma.
Wilkieson, Lt.-Col. C. B.	...	...	...Bangalore.
Wilkins, A. V.	...	...	...Kumargram.
Wilkinson, Surg.-Capt. E.	...	...	...Ferozepore.
Williams, Surg.-Capt. C. E.	...	...	...Akyab, Burma.
Williams, Capt. F. T.	...	...	...Madras.
Willis, R. A.	...	...	...Bombay.
Wilson, A. R.	...	...	...Benares.
Wilson, Lt. N. F. T. (R.I.N.)	...	...	...Bombay.
Wilson, V. S. Fellowes	...	...	...Calicut.
Wilson, W. G.	...	...	...Bombay.
Wimbridge, E.	...	...	...Bombay.
Wise, H. S.	...	...	...Europe.
Wodehouse, Lt. F. W.Europe.
Wolff, W. H. (C.E.)Bombay.
Wolf-Murray, O. (I.C.S.)Madras.
Wolseley-Smith, F.Bangalore.
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Woodburn, A. F. (I.C.S.)Ahmednagar.
Woodhouse, Lt. C.Loralai.
Woodrow, W. R.Dharwar.
Wright, Fred.Ellichpur.
Wright, F. A. (C.E.)	...	...	...Burdwan.
Wright, H. C.	...	...	...Bombay.
Wroughton, R. C.	...	...	...Bombay.
Wylie, Col. H. (C.S.I.)	...	...	...Nepal.
Wylie, R.	...	...	...Europe.
Yeld, Surg.-Major H.	...	...	...Europe.
Yeo, Edwin, W.	...	...	...Bombay.
Yerbury, Col. J. W. (Life Member)	...	...	...Europe.
Young, A. P.	...	...	...Europe.
Young, John	...	...	...Bassein, Burma.
Young, W. E.	...	...	...Bombay.
Youngusband, A. D. (I.C.S.)	...	...	...Raipur, C. P.
Yule, Col. J. H.	...	...	...Peshawar.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNT from 1st January, 1896, to 31st December, 1896.

RECEIPTS.		Rs.		EXPENDITURE.		Rs.	
		a.	p.			a.	p.
Balance in Bank on 1st January, 1896	...	1,604	3 0	Rent from 1st December, 1895, to 30th Nov., 1896, at Rs. 100 per month for the first two months and Rs. 125 per month for the remaining ten months	...	1,450	0 0
Cash with the Hon. Secretary on 1st January, 1896	...	Rs. 55	8 0	Establishment from 1st December, 1895, to 30th November, 1896	...	1,428	0 0
Petty Cash balance on 1st January, 1896	...	...	30 7 7	Library Account	...	31	11 0
Subscriptions for 1894 (arrears recovered)	...	85	15 7	Furniture Account	...	288	10 0
Do. for 1895 (do.)	...	15	0 0	Printing and Stationery	...	346	0 0
Do. for 1896	...	225	0 0	Journal Account, cost of printing Journal and Coloured Plates from England	...	7,211	1 11
Do. for 1897 (in advance)	...	9,037	15 0	Investment Account, purchased Rs. 1,000 (3½% Government Paper)	...	1,091	13 8
Do. for Journal from Members residing out of India	...	270	4 0	General Expenses	...	1,598	9 0
Do. for Life Membership	...	182	1 0	Balance in Bank on 31st December, 1896	...	1,189	9 8
Entrance Fees	...	1,200	0 0	Petty Cash balance on 31st December, 1896	...	21	14 7
Sale of Back Journals and Miscellaneous Receipts.	...	960	0 0				
Interest on Investments (3½% Govt. Paper)	...	918	12 0				
		158	3 3				
Total ...Rs.		14,657	5 10	Total ...Rs.		14,657	5 10

Examined and found correct.

BOMBAY, 1st January, 1897.

E. M. SLATER,
Hon. Auditor.

A. ABERCROMBIE,
Hon. Treasurer.

BOMBAY NATURAL HISTORY SOCIETY.

Investment Account.

1896.	Rs. a. p.	1896.	Rs. a. p.
Jan. 1 ...	Balance of $3\frac{1}{2}\%$ Government Paper deposited with the Bank of Bombay	Dec. 31..	Balance of $3\frac{1}{2}\%$ Government Paper deposited with the Bank of Bombay
	3,800 0 0		4,800 0 0
Feb. 21...	Purchased $3\frac{1}{2}\%$ Government Paper.		
	1,000 0 0		
	Rupees...		Rupees...
	4,800 0 0		4,800 0 0

Examined and found correct.

E. M. SLATER,
Hon. Auditor.

A. ABERCROMBIE,
Hon. Treasurer.

BOMBAY, 1st January, 1897.

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* This figure has been printed upside down.

† *epigæa* in text.

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H. M. PHIPSON, C.M.Z.S.,
Honorary Secretary.

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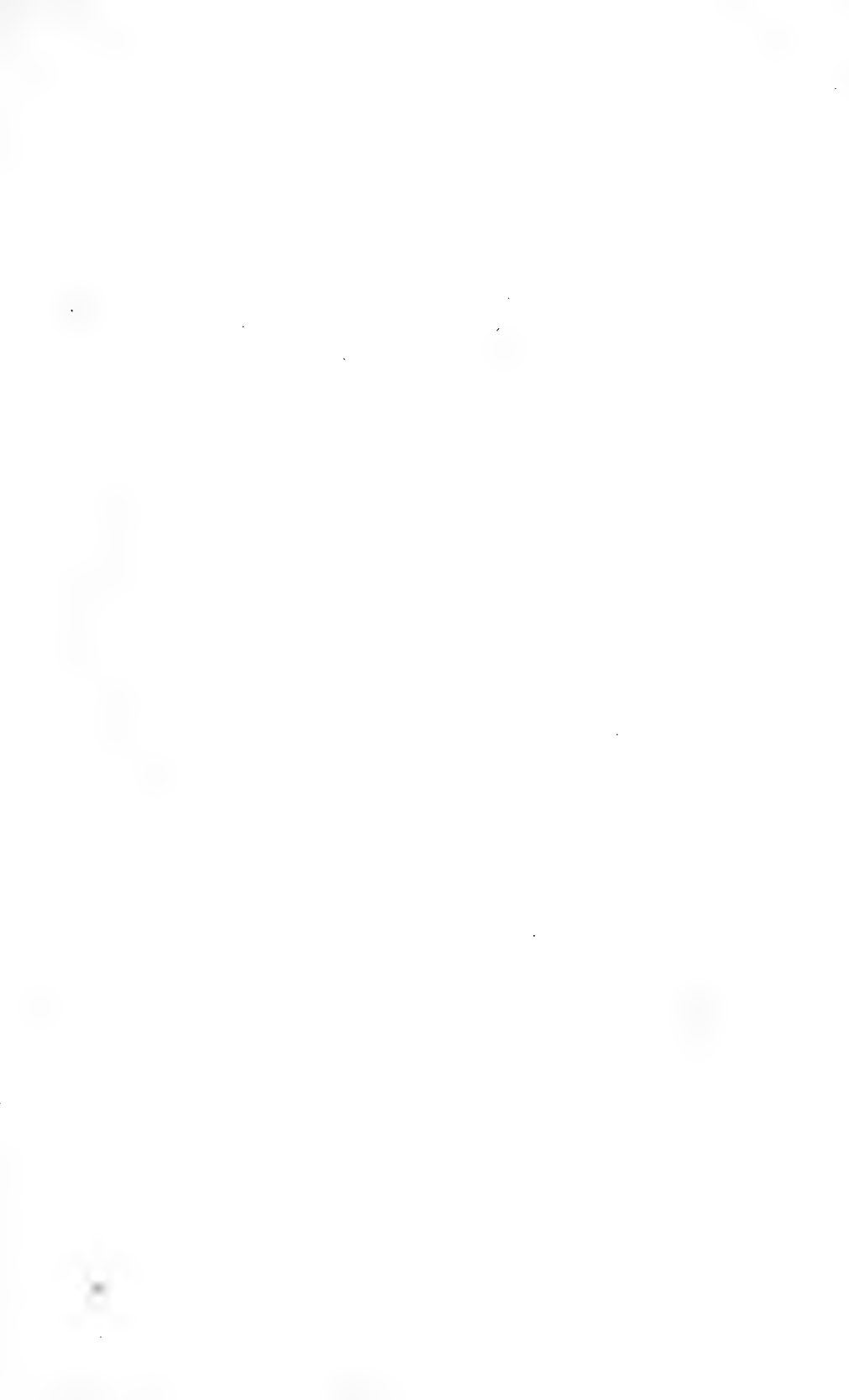
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John M. Jones Cinema Inc. London

ARACHNOTHERA LONGIROSTRIS

The Little Spider-Harrier

JOURNAL
OF THE
BOMBAY
Natural History Society.

Vol. X.]

BOMBAY.

[No. 1.

THE BIRDS OF NORTH CACHAR.

PART IV.

BY E. C. STUART BAKER, F.Z.S., M.B.O.U.

(*With Plate D.*)

(*Continued from Vol. IX, page 146.*)

Family *Motacillidae*.

(337) *MOTACILLA ALBA*.—The White Wagtail.

Hume, No. 591 Ter.; Oates No. 826.

Fairly common throughout the winter.

(338) *MOTACILLA LEUCOPSIS*.—The White-faced Wagtail.

Hume, No. 590; Oates, No. 827.

An even more common winter visitant.

(339) *MOTACILLA OCULARIS*.—The Streak-eyed Wagtail.

Hume, No. 591 Quat.; Oates, No. 828.

Not as common as the last, but a certain number are to be seen every year.

(340) MOTACILLA HODGSONI.—Hodgson's Pied Wagtail.

Hume, No. 589 Bis. ; Oates, No. 820.

Very common ; one of the first Wagtails to appear and nearly the last to leave. Possibly a resident on some of the higher ranges.

(341) MOTACILLA MELANOPE.—The Grey Wagtail.

Hume, No. 592 ; Oates, No. 832.

This bird and the next are probably the earliest of our autumn arrivals amongst this genus, and are certainly the last to leave. Both are very common and may be met with from October until quite late in April, a few birds remaining to the end of that month and even into May.

(342) MOTACILLA FLAVA.—The Blue-headed Wagtail.

Hume, No. 593 Ter. (part) ; Oates, No. 834.

(343) MOTACILLA CETREOLA.—The Yellow-headed Wagtail.

Hume, No. 594 Bis. ; Oates, No. 837.

(344) MOTACILLA CETREOLOIDES.—Hodgson's Yellow-headed Wagtail.

Hume, No. 594 ; Oates, No. 838.

A rather rare visitor ; not nearly so frequently met with as the last.

(345) LIMONIDROMUS INDICUS.—The Forest Wagtail.

Hume, No. 595 ; Oates, No. 839.

This Wagtail is not rare on the higher ranges throughout the cold weather, but below 3,500 ft. is less often met with. On the 7th May, 1891, I obtained a nest and three eggs, together with one of the parent birds. It was taken in a tiny sheltered valley at an elevation of nearly 6,000 feet. The Nagas informed me that they had not before known of the bird breeding anywhere in their hills ; so it is probable that it seldom remains throughout the year, even in the highest parts.

(346) ANTHUS MACULATUS.—The Indian Tree-Pipit.

Hume, No. 590 ; Oates, No. 341.

Almost, if not quite, the most common bird in the North Cachar Hills throughout the cold weather, and it has been seen by me so late that I think it must stay to breed on some of the higher ranges. It is quite common everywhere up to the end of April and even during the early part of May.

(347) ANTHUS RICHARDI.—Richard's Pipit.

Hume, No. 599 ; Oates, No. 845.

Very common throughout the cold weather.

(348) *ANTHUS STRIOLATUS*.—Blyth's Pipit.*Hume, No. 601 ; Oates, No. 846.*

Frequently met with during the cold weather, yet not so common as the last. I saw a pair of these birds at Guilang in June, 1893, and shot the female. On dissection she proved to contain an egg almost ready for laying, and I have no doubt her nest was somewhere near where I shot her, although I could not find it.

(349) *ANTHUS RUFULUS*.—The Indian Pipit.*Hume, No. 600 ; Oates, No. 847.*

Common and resident everywhere.

(350) *ANTHUS ROSACEUS*.—Hodgson's Pipit.*Hume, No. 605 ; Oates, No. 850.*

Fairly common, but more so in the plains than in the hills, where it does not seem to delay for any time when passing through on its way to the Himalayas.

Family *Alaudidæ*.(351) *ALAUDA GULGULA*.—The Indian Skylark.*Hume, No. 767 ; Oates, No. 861.*

By no means common in the plains, and I have seen hardly any in the hills, meeting with one or two only on the grass-covered hills towards the north-west of the district.

(352) *CALENDRELLA DUKHUNENSIS*.—The Rufous Short-toed Lark.*Hume, No. 761; Oates, No. 863.*

I met with two or three birds of this species some three years ago when staying in the plains. I have never noticed it in the hills portion of the district.

(353) *MIRAFRA ASSAMICA*.—The Bengal Bush-Lark.*Hume, No. 754 ; Oates, No. 870.*

Very common, more especially in the plains, but not ascending the hills to any height ; it seems to breed very freely in Cachar. Hume ("Stray Feathers," XI, page 237,) notices their flight being something like that of a quail, and I have often observed this myself ; moreover, it may also be noticed how these little larks, in settling again in the

grass, do not alight on the higher pieces, but squat in amongst the roots very much in the manner of the quail, though, of course, they soon give themselves away by at once mounting up higher in the grass and so showing themselves, as well as by uttering their note.

Family *Nectariniidæ*.

(354) *ÆTHOPYGA SCHERLÆ*.—The Himalayan Yellow-backed Sun-bird.

Hume, No. 225 ; Oates, No. 882.

The common form of Sun-bird in Cachar, both in the hills and plains, though it is, of course, only found during the cold weather in the latter, and it *breeds* only on the highest peaks in the hill portion.

The nests I have taken have been composed chiefly of cotton down, and, compared with those of other birds of the genus, are somewhat bulky. My eggs vary in length between '54" and '64" and in breadth between '42" and '48".

(355) *ÆTHOPYGA IGNICAUDA*.—The Fire-tailed Sun-bird.

Hume, No. 228 ; Oates, No. 887.

This is a very rare bird, the most rare of all the Sun-birds in this district with the exception, perhaps, of *Arachnothera hasselti*. During the cold months of the year a few birds may be met with scattered here and there about the district, and a few, very few, remain and breed about Hungrum.

I have seen but two nests, both of which were taken near this place, and were found in evergreen forest, attached to tall fern fronds growing in a thick undergrowth of ferns and small bushes. They were in shape somewhat between a pear-end and egg, perhaps more like an egg, with the small end drawn out, than anything else. The only article used was the very finest seed down, held together by cobwebs, and half a dozen fine, but very long, shreds of grass, all joined together at the extremity where the nests were fastened to the supporting fronds. In size they were about 4.5" in length by some 2.5" broad, the cavity being about 2.5" \times 1.0"

The two nests contained two and three eggs respectively, which were all five exactly alike, though I regret to say that I have lost the notes I made on one pair and the eggs themselves have been given

away. The remaining three are in shape broad, blunt ovals, measuring $\cdot 55'' \times \cdot 42''$; $\cdot 55'' \times \cdot 42''$ and $\cdot 54'' \times \cdot 41''$. They are white, speckled and blotched with light brown, which has a somewhat violet tinge. The markings are mostly longitudinal in character, some few being mere blurry blotches, and they are more numerous towards the larger end, where there is a faintly indicated ring, especially in one egg, in which also the specks are darker than they are in the others.

(356) *ÆTHOPYGA GOULDIÆ*.—Mrs. Gould's Sun-bird.

Hume, No. 227; Oates, No. 988.

The colour of the metallic parts on the head of this bird varies greatly in different specimens and in different lights. In some birds the whole of these portions are of an intense copper-hue, and they vary from this through purple and violet-copper to a deep purple-blue, the prevailing tint being a purple or violet-copper. On the tail, however, and upper tail coverts blue always predominates in the gloss. Again, the amount of scarlet on the breast varies considerably, in some birds this being almost absent, at other times the breast being freely splashed with it.

In some few, very old, birds the second and third pair of rectrices have a certain amount of blue gloss on them and, more often, this metallic colour is present to the very tip of the central ones. It may be noted also that the centre rectrices are partially metallic-blue on the under surface.

The bill appears to be lighter coloured in the young than in the adult bird, and I have noticed this also in other species of this genus.

I believe that the easiest key to the discrimination of the females of this genus will be found to consist in the shape and size of the bill combined with the presence, or otherwise, of the rump band.

Thus *Æ. gouldiæ* can be discriminated from the others of the first section by its smaller and less curved bill; and, in the second, *Æ. ignicauda*, by the straightness of its bill as well as by its heaviness at the base.

A description of two nests will suffice for the some half-dozen which I have seen. In shape they are the same as that of *Æ. ignicauda* already described, but are somewhat more loosely put together. The larger nest of the two mentioned is over $7''$ in length, including the supporting grasses, etc., by about $2\cdot 65''$ in breadth. The entrance, which is about an inch from the top of the chamber, is just $1\cdot 1''$ in

diameter. Internally the hollow descends 1·4" below the opening, or, altogether measures 2·6" deep by 1·5" in diameter. The material used is nearly all of the finest and softest vegetable down, kept together with very fine shreds of sun-grass, cobwebs, and a few delicate tendrils; round the entrance and joining the nest to the fern where the constant strain is greatest, the grasses and cobwebs are most numerous; and the top of the narrow portion, which encloses the stem of the frond, is all of these materials.

The second nest is far smaller and neater; the major part of the stuff used is the same as in the nest already described, *i.e.*, vegetable down, but it is fastened together very compactly with the most minute scraps of green moss and innumerable cobwebs, such being used as are so fine that singly they are practically invisible and can only be seen clearly where several cross one another or come together. This nest measures only 4·6" \times 2·2" and the inside 2·8" \times 1·4".

All the nests I have seen were, with one exception, fastened to fronds of the common bracken, about six to eight inches from their summits; the one exception was attached to the pendant twig of a small bush growing in amongst a quantity of bracken. All my nests were taken at or near Hungrum, and all of them at an altitude of some 5,000 feet and over. They were placed in fairly close-growing evergreen forest with a mixed undergrowth of ferns, bracken and small bushes. The nests were all beautifully concealed, and it was only by watching the birds that they were discovered; indeed, on some occasions, although I was engaged in watching a pair of birds which, I feel sure, had their nest close by, I yet failed to find it. Once I watched a pair for some time, and at last saw the male bird disappear into a dense tangle of fern and bracken, carrying in his mouth a small insect which I could plainly see with the help of my glasses. Waiting until the bird was out of sight, I at once hurried to the spot and searched every twig and fern, but without avail. At last, giving it up as a bad job, I abandoned my search and passed on through the piece of jungle and when on the other side, and nearly two yards away, very nearly trod on the nest, the bird flying from it almost at my feet. It was placed, hanging to a frond, about two feet from the ground, and it was so completely hidden by the dead and dried bracken which covered and surrounded it that, had not the bird left it as he

did, I do not think I should ever have found it. This nest contained three callow young of a day or two old, so was left as little disturbed as possible.

The eggs, as far as I know, are never pure-white as Murray states ("Avifauna of British India," Vol. II, p. 222), but have a white ground, and are freckled with specks, straggly and irregular blotches (always very small) and short lines of pale greyish-pink or pale brown, some so light as to be scarcely visible, whilst none are of a *very* dark colour. In one clutch and one egg of another clutch these markings are fairly numerous and *rather* dark, but in the rest they are very scanty and feebly defined; in one pair almost obsolete. In shape they are broad, obtuse ovals, very little compressed towards the smaller end. The texture is fine, close and smooth, but has no gloss, and the shell, as with all the eggs of this genus, is extremely thin and fragile. Those eggs which I have measured were as follows:—

First clutch taken 5th May, $\cdot 51'' \times \cdot 39''$ and $\cdot 52'' \times \cdot 39''$.

Second „ „ 12th „ $\cdot 54'' \times \cdot 41''$; $\cdot 53'' \times \cdot 41''$ and $\cdot 53'' \times \cdot 41''$.

Third „ „ 18th „ $\cdot 56'' \times \cdot 43''$; $\cdot 54'' \times \cdot 42''$ and $\cdot 54'' \times \cdot 42''$.

A nest with an addled egg and two young was brought to me on May 11th, another containing three young on May 12th, and on this date I found the nest containing the three young ones. On the 7th I found a nest containing three eggs on the point of hatching. This bird is by no means common; still a few are seen every year, and, about Hungrum, it is fairly numerous during the breeding season.

(357) *ÆTHOPYGA DABRYI*.—Dabry's Sun-bird.

Hume, No. 227 Bis. ; Oates, No. 889.

Hume was probably quite correct in his identification of this bird in Manipur, for I have found it not *very* rare on the higher ranges to the east bordering on that state.

The females are very difficult to identify, but I think I identified a nest rightly as belonging to this species, a female of which was caught on the nest. It was taken on the 7th May, 1891, and, as seems usually to be the case with nests of this genus, was attached to a fern frond growing in evergreen forest. The eggs, three in number and fairly fresh, were like those of *Æthopyga gouldiæ*, but the markings

are more grey and the rings about the larger end are very distinctly defined, and in one egg the markings are almost absent except about this ring and *inside* it.

The nest is a tiny structure of cotton down, held together by fine shreds of tan-coloured grass, and it only differed from those of *Æthopyga gouldiæ* in having the supporting stem of the fern incorporated with the upper part of the nest, so that, instead of being pear-shaped, it is a very fairly regular oval.

(358) *ÆTHOPYGA SATURATA*.—The Black-breasted Sun-bird.

Hume, No. 231 ; Oates, No. 890.

I have only seen this handsome little Sun-bird during the cold weather, during which season it quite deserts all hills over 2,000 feet and seems to keep to the foot of the hills and the lower valleys. I have seen very few birds myself, but two of my taxidermists—one of them an European—told me that they had seen a good many of them in the Jetinga Valley, where, however, they both failed to get me more than one skin each, and I do not think it was as common as they wished me to believe.

(359) *ÆTHOPYGA NEPALENSIS*.—The Nepal Yellow-backed Sun-bird.

Hume, No. 229 ; Oates, No. 892.

About seven years ago, when I first came to North Cachar, I found a good many of these birds, and in 1890 took a nest, but I can find no notes on the subject. The two eggs which are now in my collection measure $\cdot 57'' \times \cdot 42''$ and $\cdot 50'' \times \cdot 40''$; the ground-colour is white, or very nearly so, and the markings are the same in character as those of the rest of the genus, but they are darker and richer, more of a reddish-brown than a reddish-grey, the subordinate markings alone being of this colour. They are also somewhat more numerous—in one egg over the whole surface, in the other principally over the larger end, where they form a broad well-defined ring, the blotches here coalescing and running into one another.

As far as I remember the nest was made principally of cotton seed down, bound by grass, and I have no impression that moss was used in its construction, at all events to the extent mentioned by Hodgson ("Nest and Eggs," vol. II, p. 251).

(360) ARACHNECTHRA HASSEBTI.—Van Hassebt's Sun-bird.

Hume, No. 233 Bis. ; Oates, No. 896.

This is an extremely rare bird, and I have only seen two in a state of nature, both of which were in the Jetinga valley close to the plains. One bird, shot at Roopacherra Hailakandi, is now in the collection of Mr. Hole, and Mr. Inglis, Larsingha (close to Silchar), has another in his possession, which was, I believe, shot somewhere near the estate.

Sub-Family *Arachnotherinæ*.

(361) ARACHNOTHERA MAGNA.—The Larger Streaked Spider-hunter.

Hume, No. 223 ; Oates, No. 906.

Very common in North Cachar from the level of the plains to the top of the highest peaks, breeding principally above 2,000 feet. Gammie's description ("Nests and Eggs," Vol. II, p. 288) is very good as far as it goes, but the nests vary so much, as do the eggs, that I add the following notes which I have collected on the subject. The majority, I think, of the nests I have found have been oval in shape and not the neat cups mentioned by Gammie ; moreover, they have generally been a good deal larger, though equally neat and well built. The following measurements of nests have been taken either *in situ* or so soon after removal that the nests have not had time to get out of shape :—

1. Oval-shaped nest attached to plantain leaf, some 12 feet from the ground. Larger diameter of oval 9"; shorter 5·5"; walls about 1·5" thick ; entrance nearly 2" in diameter.
2. Nest of same shape as No. 1 attached to the under surface of a ground plant about 3½ feet from the ground. Larger diameter 10·5"; shorter 7·2"; breadth of walls about 2"; entrance over 2" in diameter.
3. Same shaped nest attached to ground plant about 2 feet from the ground. Greater diameter 5·6"; shorter 4·8"; walls 1" thick ; entrance about 1·5".

Other nests I have taken have generally measured somewhere between Nos. 2 and 3. No. 1 being exceptionally large, and No. 3 rather

unusually small. The hemispherical, or deep, cup-shaped nests are almost invariably smaller than the oval-shaped ones. In all, the materials used are much the same, the staple article being skeleton leaves more or less mixed with shreds of grass, the inner bark of some tree, resembling tow in texture, and a few bamboo leaves. The nest is *always* very neat and very compactly made, and is fastened by innumerable threads of bark and cobwebs to the leaf, these threads being so fastened as to bring the nest itself into actual contact with the leaf except at the entrance. The lining is generally of skeleton leaves, rarely of soft grass.

The number of eggs laid is either two or three, far more often the former than the latter.

The colour is wonderfully variable, but a brief description of all the clutches in my collection will show nearly all the types I have met with :

1. A pale greenish-grey, faintly and very indistinctly stippled with slate or purplish-grey, these marks being confined to a ring round the larger end, but in another clutch, of the same ground-colour, these stippings are quite absent. I have only seen two clutches of this colour.
2. Dull purple-brown or purple-grey, stippled with darker-coloured specks of the same colour, all ill-defined and blurred, sometimes in a ring, sometimes over the whole larger end, more rarely still over the whole surface.
3. A rather rich olive-brown, quite unmarked.
4. Ground a yellow-brown or yellow-grey stone-colour densely covered with inky-grey marks, quite indefinable, but apparently made up of freckles and small blotches. These generally form a ring about the larger end.

Every intermediate colour may be met with, and hardly any two clutches are alike. The shape seems to be very constant ; all my eggs are rather regular ovals, very little compressed towards the smaller end and all blunt ; some eggs show very little difference indeed between the two ends. I have only got the measurements of fifteen eggs, though I must have taken close on 30 ; these fifteen average $\cdot 83'' \times \cdot 63''$. The length varies between $\cdot 79''$ and $1\cdot 07''$, and the

breadth between $\cdot 58''$ and $\cdot 72''$. Oates ("Nest and Eggs" *loc. cit.*) gives the greatest breadth as $\cdot 75''$.

(362) *ARACHNOTHERA LONGIROSTRIS*.—The Little Spider-hunter.

Hume, No. 224; Oates, No. 909.

The little spider-hunter is not nearly as common as its larger relative, nor is it as universally distributed, alike over the plains and the highest hills. It keeps much to the lower valleys and to the foot of the mountains, and is more numerous met with in the broken land lying along the borders of Cachar and Sylhet. It breeds wherever found, and I have had several nests and eggs sent me from Jellalpoore, a Tea Estate just on the borders of North Cachar. Once I shot a pair of these birds evidently breeding at an altitude of some 4,000 feet, and, on two other occasions, I have shot them at places over 2,000 feet. In the Darjeeling ranges they would appear to ascend far higher than they do here, and I have been told that they are not uncommon in the warmer valleys about Darjeeling itself.

The nest is very similiar to that made by *A. magna*, averaging a little smaller and more often being cup-shaped than oblong. From Mr. Davidson's interesting notes in a previous number of this journal (No. 3 of 1891, Vol. VI, p. 337), it would seem that the western birds breed far earlier than they do here; most of my nests and eggs were taken in July, August and September. None of my nests have had two entrances, nor have they been anything like as big as those found by Mr. Davidson. The ground-colour of the eggs is a creamy-white, and they are marked with freckles and blotches (small) of rather brownish-pink with others of pale lavender underlying them. In nine eggs out of ten, the markings form a dense ring about the larger end and are sparse everywhere else, but in one or two eggs they are fairly numerous everywhere *in addition* to the ring. One egg in my series has the markings very much more grey in hue, and this one, except as regards its size, is very like many eggs of the genus *Æthopyga*. In shape they are generally broad, obtuse ovals; but they vary a good deal. The texture is fairly close and smooth but glossless, and the shell is very fragile.

The average of the twelve eggs I have measured is $\cdot 72'' \times \cdot 54''$.

(363) CHALCOPARIA PHENICOTIS.—The Ruby Cheek.

Hume, No. 233 Sex.; Oates, No. 911.

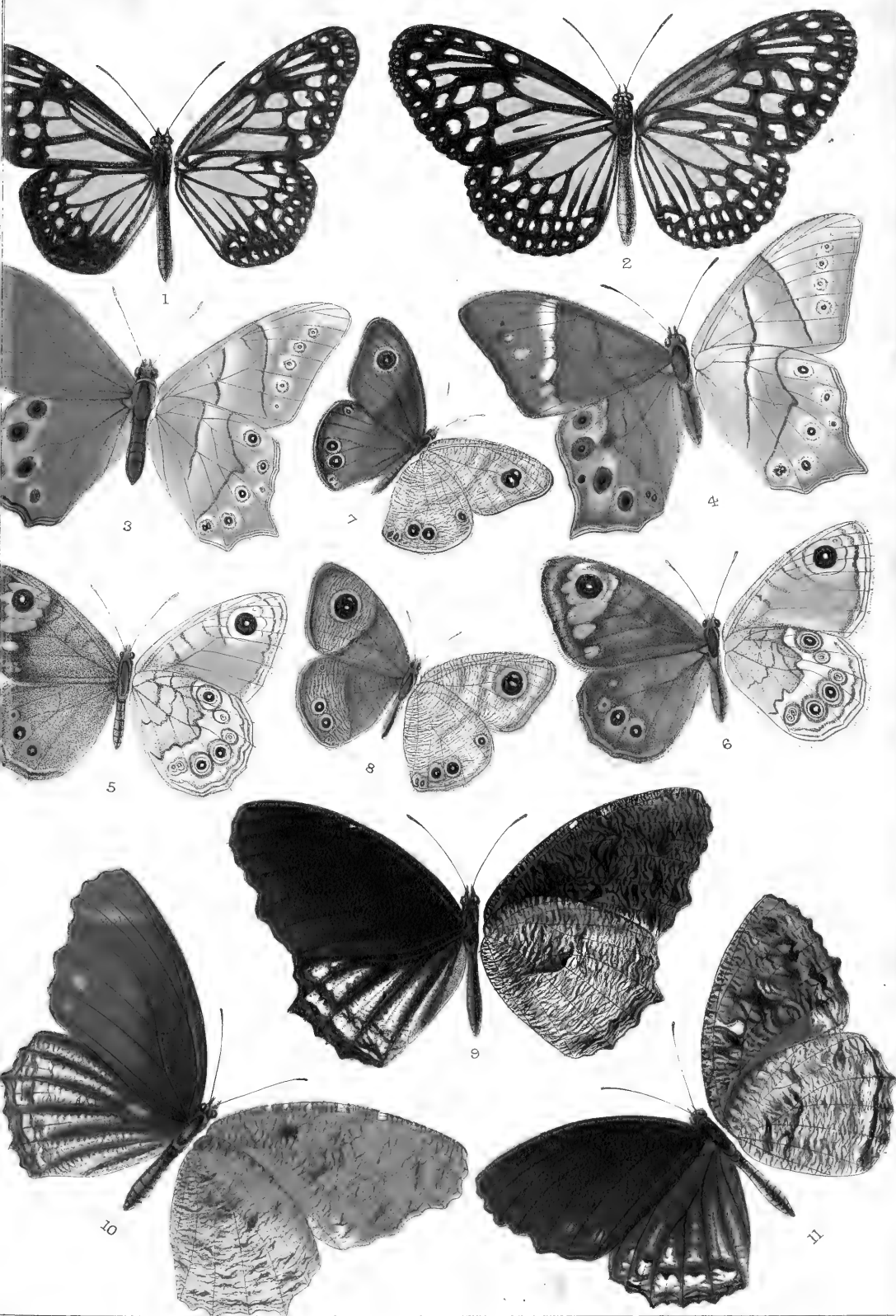
Common in North Cachar and in the plains during the cold weather. This bird is undoubtedly not a Sun-bird, but one of Oates' reasons for dividing it from that group cannot be sustained.

A microscope strong enough to show that the margins of the bill are not serrated will also show that the tongue has a distinct bush at the end, the top being divided into several points.

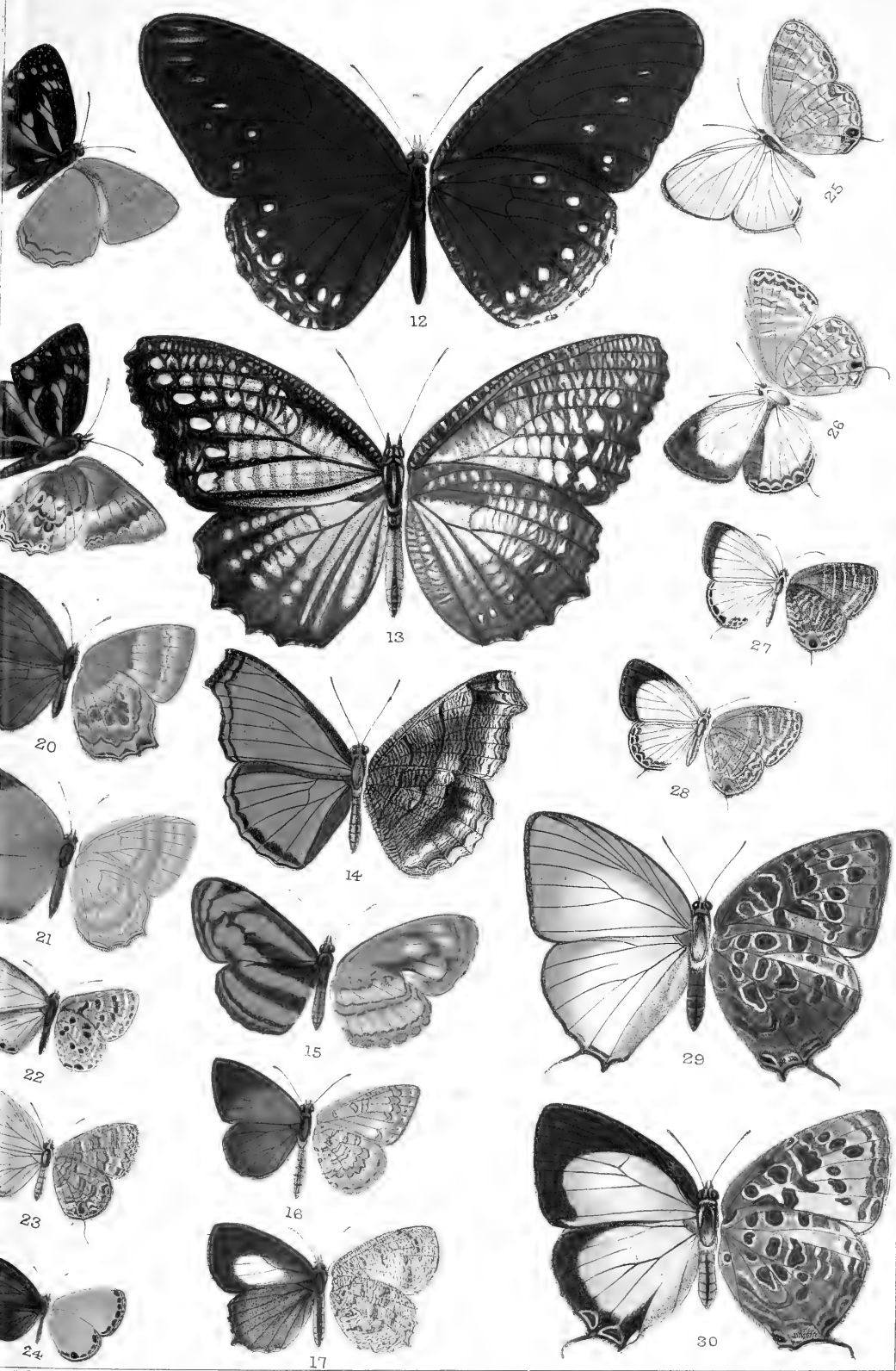
In habits it is true that the bird *is* wonderfully like *Zosterops*, but in nidification, on the other hand, it is wonderfully like the Sun-birds, *only* that seed-down is not much used in the construction of its nest. There was, or may be still, a nest in the Society's possession, which I sent to it some time in 1887 or 1888, a beautiful little brown pear-shaped affair made of fine fibres and other materials, and looking, as Hume says, as if made of hair; only in this case of brown hair instead of black.

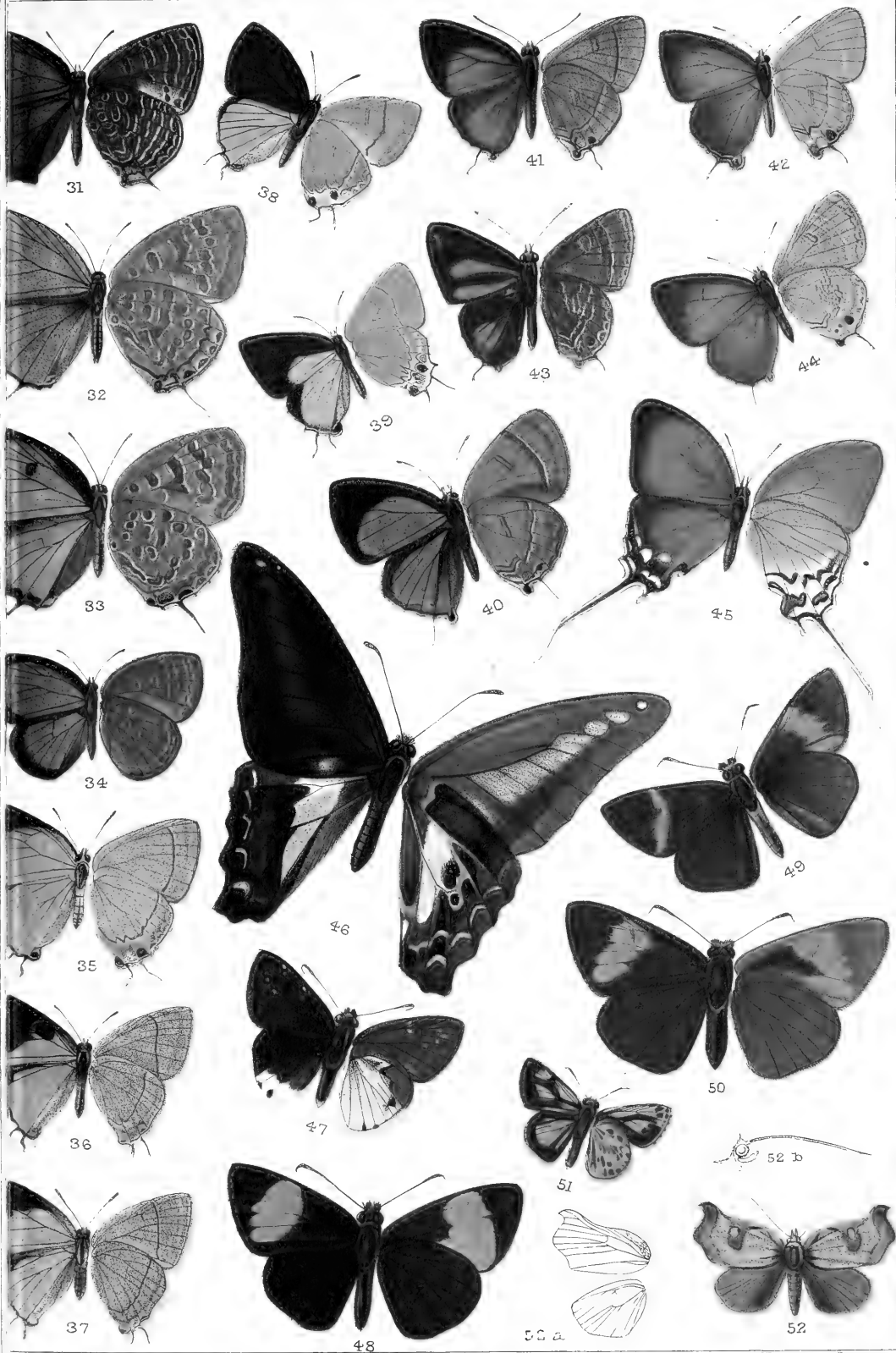
The only two eggs which I have might easily be mistaken for eggs of *Arachneethra asiatica*, but when closely looked into the markings are seen to be of a very pure inky-grey, having none of the brown or purple tint so common in the eggs of that bird; the ground is either white or very pale grey, but there is so little visible that it is hard to say which it is.

The two eggs measure $\cdot 72'' \times \cdot 48''$ and $\cdot 71'' \times \cdot 47''$.









ON NEW AND LITTLE-KNOWN *LEPIDOPTERA*
FROM THE INDO-MALAYAN REGION.

BY LIONEL DE NICEVILLE, F.E.S., C.M.Z.S., &C.

(With Plates R, S, and T.)

(Read before the Bombay Natural History Society on 19th Sept., 1895.)

Suborder RHOPALOCERA.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

1. DANAIS (*Bahora*) KHEILI, Staudinger, Pl. R, Figs. 1, ♂; 2, ♀.

D. kheili, Staudinger, Ex. Schmett., p. 48 (1885).

HABITAT : Nias Island.

EXPANSE : ♂, 2·8; ♀, 2·9 and 3·0 inches.

DESCRIPTION : MALE and FEMALE. UPSERSIDE, *both wings* fuscous, with all the hyaline markings gamboge-yellow, the marginal series of dots paler. *Forewing* with the two discal streaks divided by the upper discoidal nervule long and narrow, the lower one-third longer than the upper. UNDERSIDE, *both wings* a little paler than above, the outer discal spots outwardly becoming whitish, the submarginal and marginal series of spots pure white.

Differs from both sexes of *D. aspasia*, Fabricius (= *D. crocea*, Butler), and *D. philomela*, Zinken-Sommer (which, in the female, are absolutely indistinguishable except that the two streaks divided by the upper discoidal nervule are shorter and broader, and the marginal dots do not reach the apex of the wing in the latter, though the males are easily separable owing to the greater extent of the yellow coloration on the upperside in the latter, which invades the discoidal cell and inner discal spots), in having all the markings of the upperside yellow, in those species in the female all the hyaline markings of the forewing are bluish-white except the basal portion of the submedian streak, and the hindwing in those species has the markings on the basal half of the wing alone yellow, those on the outer half being bluish-white.

I cannot admit that *D. aspasia*, Fabricius, and *D. crocea*, Butler, are distinct, though Mr. Moore in his monograph of the subfamily in the

Proceedings of the Zoological Society of London for 1883, p. 245, keeps them so, placing the really distinct *D. philomela*, Zinken-Sommer, between them to emphasise the fact. In "Lepidoptera Indica," vol. i, p. 53, Mr. Moore says that *D. aspasia* is smaller in both sexes than *D. crocea*, and has all the transparent markings smaller. I have a very extensive series of these two supposed distinct species—*D. aspasia* from Borneo and Banka (Dr. O. Staudinger records it from Palawan in the Philippine Isles, and Heer P. C. T. Snellen from Billiton), and *D. crocea* from Burma, the Malay Peninsula, Siam, and Sumatra—and I am sure no one could sort them into two species from their respective supposed typical localities were their locality labels removed. Mr. Moore gives *D. aspasia* from Borneo only, and *D. crocea* from Burma, the Malay Peninsula, Sumatra, and Nias. The specimens from the latter island are probably the present species, which has probably also been recorded from thence as *D. philomela* by Herr Napoleon M. Kheil [Rhop. Nais, p. 15, n. 3 (1884)]. Herr Gustav Weymer in Stet. Ent. Zeit., vol. xlv, p. 257 (1885), records *D. crocea* also from Nias.

Described from one male example received from Herr H. Fruhstorfer, and two female specimens, all in my collection. Dr. Staudinger described the male only.

Subfamily SATYRINÆ.

2. LETHE (*Debis*) SAMIO, Doubleday and Hewitson, Pl. R, Figs. 3, ♂ ; 4, ♀.

Debis samio, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 360, n. 8, pl. lxi, fig. 3, male (1851) ; id., Moore, Lep. Ind., vol. i, p. 242, pl. lxxviii, figs. 2, male ; 2a, female (1892) ; *Lethe samio*, Butler, Cat. Diurn. Lep. B. M., *Satyridæ*, p. 118, n. 27 (1868) ; id., Marshall and de Nicéville, Butt. of India, vol. i, p. 145, n. 127 (1883) ; *Debis purana*, Felder, Wien. Ent. Monatsch., vol. iii, p. 401, n. 43 (1859) ; *Lethe purana*, Butler, l.c., n. 28 (1868) ; id., Marshall and de Nicéville, l.c., p. 146, n. 128 (1883).

HABITAT : East India (*Doubleday and Hewitson*) ; Java.

EXPANSE : ♂, 2·8 ; ♀, 2·9 inches.

Mr. Moore has described both sexes of this species very fully, so I need not do so again. A remarkable feature in this butterfly is the third ocellus from the apex of the hindwing on the underside being placed greatly out of line, nearly touching the marginal line ; this

character is found also in *L. sinorix*, Hewitson, but not to so great an extent.

I am indebted to Herr H. Fruhstorfer for the gift of two pairs of this interesting species from Java, but without precise locality. Its habitat was previously only vaguely known as from East India. Heer P. O. T. Snellen in Tijds. voor Ent., vol. xxxv, p. 4, n. 4 (1892), suggests that *Debis manthara*, Felder, described from both sexes from Java, and said by Felder to be allied to *D. mekara*, Moore, is the same species as *D. samio*. An examination of the type specimens is desirable before this statement is finally accepted.

3. LASIOMMATA LAURION, n. sp., Pl. R, Figs. 5, ♂; 6, ♀.

Lasiommata mæcula, Moore (nec Felder), Lep. Ind., vol. ii, p. 8, pl. xvi, figs. 2, 2a, male; 2b, female (1893).

HABITAT: Kunawur, Pangi, N.-W. Himalayas (*Moore*); Pangi and Gonas Pass, Western Himalayas.

EXPANSE: ♂, 2.1 to 2.4; ♀, 2.3 to 2.4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* ochreous-brown with a slight gloss; *cilia* cinereous. *Forewing* with the usual large subapical white-pupilled black ocellus set in a ferruginous ring which is outwardly twice indented by the discoidal nervules; an elongated ferruginous patch posterior to the ocellus in the second, and a smaller oval one in the first median interspace, sometimes with a very small spot in the submedian interspace. *Hindwing* with two, three, or four ocelli similar to the one on the forewing, the one in the second median interspace always the largest. UNDERSIDE, *both wings* pale stone-colour. *Forewing* with a large discal ferruginous patch, extending into the posterior outer half of the discoidal cell, not reaching the outer and inner margins; two dark transverse bars across the middle of the cell; the disco-cellular nervules defined by a dark line; the subapical ocellus as above, with an outer ochreous ring, which is itself outwardly defined by a narrow dark line, the ocellus placed in a large quadrate ochreous patch; a submarginal broad fuscous line outwardly defining the ferruginous discal area; two marginal fuscous threads. *Hindwing* with the usual three narrow fuscous lines crossing the discal half of the wing, all very irregular, especially the exteriormost one; the disco-cellular nervules defined by a fuscous line;

the usual six outer-discal ocelli, and three fine marginal lines. No discal oblique "male-mark" of modified black scales across the forewing on the upperside as in *L. schakra*, Kollar, *L. menava*, Moore, *L. nasshreddini*, Staudinger, *L. mæroides*, Felder,* and *L. majuscula*, Leech. FEMALE. UPPERSIDE, both wings somewhat paler than in the male. Forewing with the ferruginous markings of the male somewhat more extensive and paler; always with a considerable sized rounded spot in the submedian interspace. Otherwise as in the male.

In coloration and markings this species is hardly distinguishable from *L. schakra*, Kollar, but the absence of the "male-mark" will differentiate it as regards that sex. The females of the two species are almost precisely alike, unless the greater irregularity of the outer-discal fuscous line on the underside of the hindwing in *L. laurion* be sufficient to distinguish between them; but this feature in *L. schakra* appears to be very inconstant. It is abundantly distinct from *L. menava*, Moore, and *L. mæroides*, Felder, in the male, those species have a very broad and prominent "male-mark" which *L. laurion* lacks altogether; and on the underside of the hindwing of the former (the latter I have not seen) the above-mentioned line is nearly even, not highly zigzagged.

This species is the one referred to under "*Amecera*" *mæroides*, Felder, in Butt. India, p. 181, from Pangi. I subsequently examined the type of the latter in Dr. Felder's collection in Vienna, and as it has a broad sex-mark, the present species is evidently distinct, *L. laurion* entirely lacking it. Mr. P. W. Mackinnon has obtained numerous specimens in August from the Gonas Pass to the north of Mussoorie towards the Thibetian frontier. In Pangi, to the north of Dalhousie, it occurs in July and August. It is a butterfly of high elevations only, and appears to be confined to the outer borders of the Central Asian tableland at the western end of the Himalayas.

Since the above was in type, Mr. G. F. Hampson of the British Museum (Natural History), after examining the types of *L. mæricula* and *L. mæroides* in the collection of the Hon. Walter Rothschild, has sent me the following interesting notes with sketches:—" *L. mæricula* is a female, the forelegs undoubtedly feminine; consequently there is

* The Russian writers give *L. mæroides* and *L. nasshreddini* as synonyms of *L. menavas*, to which I would add *L. mæricula*.

no 'male-mark' on the upperside of the forewing, but it has the abdomen of a male stuck on with the claspers exposed. The forewing on the upperside has the yellow patch very broad, narrowing slightly to the first median nervule, with a quadrate yellow patch below that vein [*i.e.*, exactly as in Moore's figure of *L. mæroides* in Lep. Ind., pl. xcvi, fig. 3, *female*]. Underside, hindwing has the outer-discal line sinuous below the costa and zigzag towards the abdominal margin [*i.e.*, as in *L. menava*]. *L. mæroides* is a male, the forewing on the upperside with a broad 'male-mark'; the yellow patch small and obsolescent; the subapical small ocellus beyond the usual large ocellus very minute. Underside, hindwing exactly as in *L. mæricula*." From this note it is evident that Felder described *L. mæricula* from a female, not a male as stated by him. The species should, I think, be sunk as a synonym of *L. menava*; both species were described in the the same year (1865), but Mr. Moore figured his type male, which Felder did not do. *L. mæroides* should, I think, also be sunk as a synonym of *L. menava*; the male is evidently the same as that species according to Mr. Hampson's and my examination of the type; and the female, which Felder figured, appears to be its true opposite sex. There only remains Mr. Moore's figure in Lep. Ind. of what he calls *L. mæroides*, female, to deal with. It is obvious, I think, that it is only *L. menava*. No good character is given by which to separate it; the discal patch on the upperside of the forewing is larger than in his figure of *L. menava*, female, and it has two instead of four ocelli on the hindwing, but these features are obviously inconstant in this group of the genus. All this confusion would have been avoided if Mr. Moore had only examined the types of Felder's two species before he sat down to write about them.

An interesting little monograph might be written on the genus *Lasiommata* if all the species in it from the various localities where the genus is found were got together and critically compared. As far as I am able to gather from books and the scanty material available, all the species except *L. laurion* have a "male-mark." Two species of the present group occur in Europe, *L. mæra*, Linnaeus, and *L. hiera*, Fabricius, both of which have male secondary sexual characters.*

* Inadvertently in Butt. India, vol. i, p. 180, footnote, in describing "*Ameocera*" *mæra* it is stated that that species "lacks the usual sexual streak," which is incorrect.

The type of the genus is *L. megæra*, Linnæus, which belongs to a different group to *L. mæra* and its allies. Mr. Moore in Lep. Ind., vol. ii, p. 5, in describing the genus *Lasiommata*, notes that it has a "glandular fascia" in the male, but in describing *L. mæra*, Felder, he says the "forewing does not possess a glandular fascia." As a rule, Mr. Moore gives the presence or absence of secondary sexual characters generic rank; but in this instance he has, I think, done well in not doing so, as the species with and without this character are obviously generically very closely allied.

The type specimens figured are from the Gonas Pass.

4. YPTHIMA IARBA, n. sp., Pl. R, Figs. 7, ♂; 8, ♀.

HABITAT: Manipur; N.-E. Sumatra.

EXPANSE: ♂, 1.6; ♀, 1.8 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* hair-brown, the basal half darker; a darker marginal band about 2 mm. wide; *cilia* cinereous. *Forewing* with the usual oval black subapical ocellus outwardly defined by an orange ring, and bipupilled with silver. *Hindwing* with five ocelli, the anterior one in the upper subcostal interspace and the two geminated posterior ones in the submedian interspace minute, the pair in the median interspaces large, oval, black, with a well-defined narrow outer orange ring and a single silvery pupil; an anteciliary pale thread. UNDERSIDE, *both wings* whitish, fairly evenly throughout covered with rather coarse ochreous-brown striolæ. *Forewing* with two rather obscure straight discal dark brown fasciæ, neither reaching the costa nor the inner margin, the inner one half as wide as the outer; the ocellus as on the upperside, but the orange iris wider and better defined. *Hindwing* with the outer of the two discal bands of the forewing present but very faint; five ocelli as above, but the anterior and two posterior ones much larger, the ones in the median interspaces the same size as above; all the ocelli have an outer narrow dark brown ring. FEMALE. UPPERSIDE, *both wings* differ from the male in being paler. *Forewing* with the discal area from the outer discal band of the underside to the marginal band paler than the rest of the wing and striated faintly with dark brown. *Hindwing* also has a broad discal similar area. Otherwise as in the male,

This species would appear to come into Mr. H. J. Elwes' Group V* of "A revision of the genus *Ypthima*," though it is smaller than any of the species included in it, the female measuring 45 mms. only instead of 50. It appears to be nearest to the wet-season form of *Y. methora*, Hewitson, but is considerably smaller, and has only one apical ocellus to the hindwing instead of two. It agrees with it in having no "male-mark," though I am not quite sure about this character, androconia may be present, but if they are, they are but few in number. It may be near *Y. persimilis*, Elwes (l. c., p. 39), from Mao, Manipur, 7,000 feet, but though that species appears to have five ocelli also, they are differently arranged; there are two apical ones instead of one, and one anal one instead of two. The expanse of this species is not given. *Y. iarba* reminds one of *Y. newboldi*, Distant, with which it agrees in size and in having five ocelli to the hindwing; but that species has the anterior ocellus in the lower instead of the upper subcostal interspace. Messrs. Elwes and Moore both agree in sinking *Y. newboldi* as a synonym of *Y. baldus*, Fabricius. The specimen described is probably an aberration or "sport."

Described from a single male taken between Manipur and Tammu kindly given to me by Captain E. Y. Watson, who has suppressed his own description of the species in favour of mine, and several examples from N.-E. Sumatra in Hofrath Dr. L. Martin's collection and my own. The types are from Sumatra.

Subfamily ELYMNIINÆ.

5. ELYMNIAS (*Melynias*) ERINYES, n. sp., Pl. R, Figs. 9, ♂; 10, ♀.

HABITAT: Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, 3.2; ♀, 3.4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* fuscous, with a slight purple gloss in some lights. *Forewing* immaculate. *Hindwing* with a series of broad greenish-whitish-mottled-with-black streaks between the veins; these streaks do not reach the outer margin; they are anteriorly short, but increase in length posteriorly. UNDERSIDE, *fore-*

* Trans. Ent. Soc. Lond., 1893, p. 36.

wing with the ground-colour purplish, covered with coarse black mottlings; the costa bears some whitish mottling, as also does the inner margin as far as the first median nervule. *Hindwing* has the basal-third purplish coarsely mottled with black as in the forewing, crossed by a broad ferruginous band parallel with the costa, extending from the base of the wing to about the second-third of the costa from the base; the outer two-thirds of the wing white, also coarsely mottled with black. FEMALE. UPPERSIDE, *both wings* much paler than in the male, the ground-colour being reddish-brown instead of black, the markings similar. UNDERSIDE, *both wings* as in the male, but the ground-colour and mottlings much paler.

This species certainly belongs to the *casiphone* group, *E. casiphone*, Hübner, having been recorded from Singapore by Butler (this habitat requires confirmation I think), Java by Wallace, and E. and S.-E. Mindanao in the Philippine Isles by Semper (the latter, however, has been subsequently named *E. casiphonides*, Semper, in Schmett. Philipp., p. 350, n. 73 (1892). The male of *E. erinyes* differs from specimens of the same sex of *E. casiphone* from Java in my collection in the forewing being longer and immaculate, *E. casiphone* having numerous large bluish-white spots on the disc. On the hindwing *E. erinyes* is prominently striped with greenish-whitish, which is not the case with *E. casiphone*. It is still nearer to *E. kamara*, Moore, from Java, of which I possess both sexes from thence, the male of *E. erinyes* differing on the upperside of the hindwing in the streaks between the veins being continuous and much longer, reaching almost to the median nervule and extending into the discoidal cell; in *E. kamara* the streaks are very much shorter, and are strongly divided into two portions. The female of *E. kamara* bears numerous spots and streaks in the forewing on the upperside, while that sex of *E. erinyes* is unmarked.

Described from a male in my collection taken in the Battak mountains in September, 1894, and a female in the collection of Hofrath Dr. L. Martin. I have seen another male in Dr. Martin's collection. I have figured the male of *E. kamara* on Pl. R, Fig. 11, from a specimen in Dr. Martin's collection from Java.

6. ELYMNIAS (*Melynias*) DOHRNII, n. sp., Pl. S, Fig. 12, ♂.

HABITAT : Bohorok, East Sumatra.

EXPANSE : ♂, 3.7 inches.

DESCRIPTION : MALE. UPPERSIDE, *forewing* black, strongly glossed with purple in some lights; a very irregular discal series of seven spots, the anteriormost in the subcostal interspace is rich powdery purple and forms a streak reaching the outer margin, the second in the upper discoidal interspace is also purple, but is much shorter than the streak above it and does not reach the outer margin, the third in the lower discoidal interspace is purple and is shorter again than the spot above it, the fourth is a short white streak placed in the middle of the second median interspace, the fifth is a small round white spot in the middle of the first median interspace, the sixth and seventh spots are placed outwardly obliquely one above the other in the submedian interspace towards the outer margin, and are out of line with the rest, being closer to the outer margin than they. *Hindwing* with an outer-discal series of seven nearly equal-sized small round pure white spots, one in each interspace except the submedian, which has two; the outer margin mottled with white, with two small quadrangular white spots on the margin in each interspace. UNDERSIDE, *both wings* piceous. *Forewing* with the basal half of the costa barred with white; the margin at the apex of the wing also slightly sprinkled with white; the five posterior spots of the discal series of the upperside present and pure white; the inner margin towards the base broadly pale and highly polished. *Hindwing* with a few scattered white dots at the base and along the abdominal margin; otherwise as on the upperside.

Allied to *E. patna*, Westwood, from Kumaon, Sikkim, Assam, and the Karen Hills of Burma, from which it differs in the forewing being longer and narrower, the outer margin more entire, the purple streaks on the upperside smaller and fewer in number, being reduced posteriorly to small white spots; the hindwing is much smaller, the outer margin almost entire instead of being strongly indented, and the outer margin on the upperside being sprinkled with whitish. On the underside of the forewing the disposition of the white spots is quite different, in *D. patna* the spots are parallel to the outer margin throughout, in *E. dohrnii* the uppermost spot of the first three is

nearest the margin, the two following being at increasing distances from it, while the two lowermost spots are quite out of line with the rest, being nearest of all to the margin. "*Elymnias*" *kochi*, Semper, and "*Melanitis*" *beza*, Hewitson, both from the Philippine Isles, are also more distantly allied species.

Described from a single example obtained in September, 1894, by Herr M. Ude, the collector of Dr. H. Dohrn of Stettin, after whom I have much pleasure in naming the specimen. The type is in Dr. Martin's collection.

7. ELYMNIAS (*Melynias*) CERYXOIDES, n. sp., Pl. S, Fig. 13, ♂.

HABITAT : Battak Mountains, N.-E. Sumatra.

EXPANSE : ♂, 3·4 to 3·5 ; ♀, 3·8 inches.

DESCRIPTION : MALE. UPPERSIDE, *forewing* pale bluish-white, greenish-white, or purplish-white ; all the veins broadly defined with black ; the costa and anterior half of the discoidal cell black ; the basal half of the costa dotted with white strigulae ; the outer half of the wing more or less black, bearing a recurved series of seven increasing rounded spots of the ground-colour. *Hindwing* with the ground-colour pale yellowish-white ; the veins on the anterior half of the wing broadly defined with black, on the posterior half ferruginous ; the apex broadly and outer margin decreasingly black ; the anal region more or less broadly ferruginous. *Cilia* of the wings black, bearing two white dots on each interspace. UNDERSIDE, *both wings* with the ground-colour whitish, but heavily striolated almost throughout with ferruginous, this striolation or cross-hatching showing through on the upperside, giving the pale portions of the wings a mottled appearance. *Forewing* with the black areas of the upperside replaced by ferruginous below ; the costa dotted throughout its length with white strigulae ; the outer-discal series of spots present as above, but not at all prominent. *Hindwing* has the costa and outer margin broadly ferruginous, the ground more or less striolated, and the veins broadly defined, with the same colour ; an outer-discal series of small white spots, the anterior ones rounded, the four posterior ones very small and linear. *Thorax* bluish-white streaked with black ; *abdomen*

above and at the sides ochreous, beneath black. FEMALE has the wings a little broader than in the male, but is similar in markings.

Near to "*Melanitis*" *ceryx*, Boisduval, Sp. Gén., pl. ix, fig. 8, female (1836), from Java, differing therefrom on both sides of both wings in the disc being heavily irrorated on the upperside with blackish, on the underside with ferruginous, striolæ; the anal area of the hindwing is more broadly ferruginous on the upperside; on the underside of the forewing in *E. ceryx* the outer-discal series of spots are much more prominent, beyond which are a few white striolæ only; on the hindwing there is also an outer-discal series of seven large round white spots which are very small and sometimes almost obsolete in *E. ceryxoides*; in *E. ceryx* the striolation is confined to the outer and abdominal margins. *E. ceryxoides* appears to be a mimic of *Danaïs* (*Caduga*) *tytioides*, de Nicéville, which occurs with it in the mountains, while *E. ceryx* appears to mimic *Danaïs* (*Mangalisa*) *albata*, Zinken-Sommer. Mr. Henley Grose Smith and Dr. B. Hagen have both recorded *E. ceryx* from Sumatra, the species described above being the one probably meant.

Hofrath Dr. L. Martin and I possess numerous examples, some of which were taken in June and July.

Subfamily NYMPHALINÆ.

8. EURYTELA FRUHSTORFERII, de Nicéville, Pl. S, Fig. 14, ♂.

E. fruhstorferii, de Nicéville, Proc. A. S. B., 1895, p. 109, n. 2.

HABITAT: Central Java.

EXPANSE: ♂, 2.2 inches.

DESCRIPTION: MALE. UPPERSIDE, both wings shining cobalt-blue with a distinctly green shade in some lights. Forewing with the costa narrowly blackish owing to the blue scales which overlie the black ones being less numerous; the truncated apical portion of the outer margin rather broadly black, posterior to which the outer margin bears an anteciliary black thread only; a submarginal narrow waved black line, which exactly follows the outline of the wing. Hindwing with the costa somewhat broadly black, bounded posteriorly by the subcostal nervure and the first subcostal nervule; the abdominal

margin broadly fuscous ; a submarginal somewhat broad and nearly straight black band. UNDERSIDE, both wings fuscous, more or less profusely mottled throughout with grey scales, crossed by three parallel equi-distant discal black lines, with a fourth submarginal highly lunulated narrower black line. *Cilia* of both wings white, marked with black at the terminations of the veins. *Thorax* and *abdomen* blue above, fuscous beneath.

Very close to *E. castelnaui*, Felder, recorded from the Malay Peninsula (*Felder*); Singapore and Borneo (*Wallace*); Perak (*Distant*); Nias Island (*Kheil*); Palawan (*Staudinger*); Sumatra (*Snellen*, *Grose Smith*, *Hagen*); differing, however, on the upperside of both wings in the blue coloration being of a different shade, distinctly lighter, with a strong gloss, which in some lights causes the surface to present a decidedly green appearance. In figuring *E. castelnaui*, Felder quite correctly portrays the upperside "without gloss," and Dr. A. R. Wallace notes the same thing. The only difference in the markings noticeable is on the upperside of the hindwing, *E. castelnaui* having the submarginal black line very narrow and clearly defined, *E. fruhstorferii* having it many times broader, and the edges somewhat diffused.

Described from a single example kindly given to me by Mr. H. Fruhstorfer and captured by him in Central Java at 1,500 feet elevation in 1891.

9. NEPTIS (*Rahinda*) AURELIA, Staudinger, Pl. S, Fig. 15, ♀.

N. aurelia, Staudinger, Ex. Schmett., p. 145 (1886).

HABITAT : Malacca (*Staudinger*); Daunat Range, Middle Tenasserim; Karen Hills, 500 to 1,500 feet—Burma.

EXPANSE : ♂, ♀, 1.6 to 1.7 inches.

DESCRIPTION : FEMALE. UPPERSIDE, *both wings* black with deep tawny markings. *Forewing* with the discoidal band broad, extending well below the median nervure, the end of the discoidal cell anteriorly indicated by a prominent short black bar; the discal band broad, in two portions, the anterior portion has its outer edge even and regularly curved, its inner edge is very irregular, the veins entering the edge from that side being defined with black and almost dividing the band into three portions; the posterior portion of the band consists of two

parts, the anterior portion is rounded with a short narrow anterior projection, the posterior portion is elongated and reaches the inner margin inwardly obliquely; a broad nearly even submarginal line slightly disconnected where it is crossed by the third median nervule; a greatly disconnected series of indistinct marginal spots. *Hindwing* with a recurved discal band from the costa to the abdominal margin; the submarginal band very broad, broader than the discal band, interiorly attenuated and not quite reaching the costa, posteriorly ending on the abdominal margin; a narrow rather indistinct marginal line. *UNDERSIDE*, *forewing* with the ground-colour and markings much paler than on the upperside, some of the latter almost white in the middle; a narrow subcostal yellow streak; the discoidal band as above; the discal band everywhere entirely crossed by the black veins; between this and the submarginal band there is a narrow yellow line which becomes obsolete at about the middle of the wing; the marginal lines as above. *Hindwing* with the ground-colour even paler than in the forewing, glossed throughout with pale shining violet; the bands as above but very pale, almost whitish, with an additional macular pale band in the middle of the wing between the discal and submarginal bands; in the discoidal cell towards its base are two prominent round dark dots, the inner one almost touching the subcostal nervure, the outer one quite touching the second subcostal nervule; anterior to the last-named dot is an irregular dark bar which commences on the second subcostal nervule and ends on the costal nervure.

Very near to *N. (Rahinda) paraka*, Butler, described from Malacca, in my collection from Jorehât in Assam, Bassein in Arracan, Bhamo in Upper Burma, Kwala Lumpur (Selangore) and Perak in the Malay Peninsula, Sumatra, Java, and Borneo; recorded also from Sylhet, the Daffa Hills, Chittagong, Mergui, Nias Island, and Palawan in the Philippine Isles, from which it may instantly be distinguished on the upperside of the forewing in the two (in *N. paraka* there are often three) marginal lines being parallel to the outer margin instead of being "deeply bisinuate so as to form two wide arches;" all the markings are also of a deeper tawny hue on both surfaces; the hindwing on the underside is prominently glossed with pale violet instead of being dull "ochre-yellow," and the basal markings or lituræ differ in shape and position. Dr. O. Staudinger, in

EX. Schmett., p. 145 (1886), states that *N. dahana*, Kheil, Rhop. Nias, p. 24, n. 57, pl. v, fig. 27 (1884), equals *N. paraka*. It is also allied to *Neptis bieti*, Oberthür,* from Tâ-Tsien-Loû, Western China, (sex not stated, now whether it is a true *Neptis* or a *Rahinda*), from which *N. aurelia* may be at once distinguished by the tawny markings of the upperside being nearly twice as extensive; on the underside of the hindwing the disposition of the bands seems to be quite different. The drawing here reproduced has been submitted to Dr. O. Staudinger, who states that it certainly represents his species.

Described from three female examples in my collection from Tenasserim, and one male in Captain E. Y. Watson's, the latter captured in the Karen hills, 500 to 1,500 feet elevation, on 13th December, 1890. It does not differ from the female specimens described above, except in having the wings somewhat narrower, and the apex of the forewing less rounded.

Family LYCÆNIDÆ.

10. GERYDUS GÆSA, n. sp., Pl. S, Fig. 16, ♂.

HABITAT : Battak Mountains, N.-E. Sumatra.

EXPANSE : ♂, 1.2 to 1.4; ♀, 1.3 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* shining fuliginous-brown, the outer portions—especially the apical third of the forewing—darker than the rest of the wings. *Cilia* cinereous. *Forewing* with the usual three minute ochreous streaks on the costa towards the apex of the wing. *Hindwing* unmarked. UNDERSIDE, *both wings* pale ochreous-brown, all the markings of a slightly darker shade of brown than the ground, outwardly defined with whitish. *Forewing* with three increasing spots in the discoidal cell; three costal spots; an outer discal series of four spots from the costa to the second median nervule, followed by a suffused whitish spot, and then a very dark oblique spot near the outer angle; a submarginal series of small but distinct black dots; the inner margin broadly whitish. *Hindwing* with the basal half bearing numerous spots arranged nearly regularly over the surface; a prominent discal series of large spots, the anteriormost of

* Etudes d' Ent., vol. xix, p. 16, pl. viii, fig. 69 (1894).

which is detached from the rest, placed nearer the base of the wing ; a submarginal series of dots as in the forewing. FEMALE, coloured and marked exactly as in the male, but differs in shape, the apex of the forewing not being produced, and the hindwing is angled at the termination of the third median nervule.

Very near to *G. gopara*, de Nicéville, which is probably a synonym of *G. biggsii*, Distant, from which it may instantly be known by the absence of the oblique discal white fascia on the upperside of the forewing in both sexes of that species. The immaculate character of the forewing above distinguishes this from all the species of the genus known to me. On the underside the markings are precisely as in *G. gopara*, except that the white band of the forewing is wanting.

Described from numerous examples in the collection of Hofrath Dr. L. Martin and my own, some of which were taken in January and March.

11. ALLOTINUS APUS, n. sp., Pl. S, Fig. 17, ♀.

HABITAT : N.-E. Sumatra.

EXPANSE : ♀, 1·4 inches.

DESCRIPTION : FEMALE. UPPERSIDE, *both wings* dull plumbeous-black, the forewing darker than the hindwing. *Forewing* with a large oval discal pure white patch, anteriorly extending slightly into the discoidal cell and lower discoidal interspace, posteriorly ending on the inner margin, but that portion of the patch posterior to the submedian nervure as well as the portion reaching to the base of the wing is not pure white, being sullied with plumbeous scales. *Hindwing* immaculate. UNDERSIDE, *both wings* creamy-white mottled with numerous small and large pale brown dots and spots. *Forewing* with three increasing spots in the cell larger than the others, and an outer-discal series of six larger spots, the series broken at the third median nervule, the three posterior spots shifted inwardly towards the base of the wing ; a marginal series of five larger spots. *Hindwing* with seven larger basal spots arranged in two series, four and three, the outer series the larger ; an elongated spot at the end of the cell ; an irregular discal series ; and a marginal series as in the forewing. *Cilia* throughout whitish.

Near to *Allotinus major*, Felder,* from Celebes, from the same sex of which it appears to differ in its smaller size, highly scalloped instead of even hindwing, and creamy-white instead of glaucous-white underside. Also near to *A. fallax*, Felder,† from the Philippines, differing from Felder's figure of the same sex in its more scalloped hindwing, and in the absence of the black white-encircled discocellular spot on the upperside of the same wing. The second subcostal nervule of the forewing arises well before the apex of the discoidal cell, exactly as it does in the same sex of *A. fallax*.

Described from two examples obtained in the Battak Mountains in February and August, one each in Dr. Martin's and my collection.

12. SIMISKINA PAVONICA, n. sp., Pl. S, Fig. 18, ♂.

HABITAT : Battak Mountains, N.-E. Sumatra.

EXPANSE : ♂, 1.3 to 1.4 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* deep black, with markings of a rich blue in some lights, turning slightly to emerald-green in other lights. *Forewing* with a streak posterior to the discoidal cell, commencing from the base of the wing, divided by the black first and second median nervules ; three increasing subapical spots, the uppermost minute, the other two with their inner ends pointed, their outer ends broad, excavated ; a large round spot in the middle of the submedian interspace, touching the submedian nervule, beneath which is a lengthened streak reaching the inner margin ; an increasing submarginal series of six round spots, the uppermost minute, the posteriormost the largest. *Hindwing* with the costa broadly pale ochreous ; a short streak at the extreme base of the wing ; three large discal quadrate patches divided by the first and second median nervules ; posterior to which are three large marginal lunules ; the extreme margin narrowly black. UNDERSIDE, *both wings* rich castaneous ; the discoidal cells closed by a narrow deeper red line ; a discal somewhat irregular deep red line, outwardly defined by a pale violet line, the red line nearly straight in the forewing, commencing on the costa, ending just posterior to the first median nervule, in the hindwing commencing on the costa, curved round to the middle of the

* Reise Novara, Lep., p. 286, n. 367, pl. xxxv, figs. 29, male ; 30, 31, female (1865).

† Reise Novara, Lep., p. 285, n. 366, pl. xxxv, figs. 24, male ; 25, 26, female (1865).

abdominal margin, its middle portion lunular; a submarginal deeper red line, inwardly defined by a pale violet line, the line straight in the forewing, lunular in the hindwing, where its four posterior lunular portions are outwardly defined by a narrow black line.

Forewing with the inner margin broadly pale fuscous, highly polished.

* *Hindwing* with a very fine pure white marginal line from the third median nervule to the anal angle, outwardly defined by an equally fine deep black line; the extreme margin castaneous. *Cilia* very narrow, fuscous throughout. *Body* above black, beneath ochreous.

Very near to *Simiskina pediada*, Hewitson, from Singapore (Hewitson), and Mergui, Lower Burma (Doherty),* from which it appears to differ on the upperside of the forewing in not having the spot on the inner margin continued to the base of the wing, and in the hindwing in having a small basal spot only in the submedian interspace, in *S. pediada* this spot is developed into a long streak, which is joined to the discal spot in the same interspace. On the underside the ground-colour is of a much brighter shade of red and is concolorous throughout both wings, in *S. pediada* the outer two-thirds of the hindwing is much paler than the rest, being "irrorated with whitish scales." I possess no specimen of *S. pediada*. It is quite distinct from *S. pharyge*, Hewitson, described from Borneo, and captured at Renong, Western Siam, by Mr. W. Doherty, and of which I possess specimens from Penang, Perak, and N.-E. Sumatra, that species being dull hair-brown on the underside in both sexes, instead of rufous or castaneous, and has a marginal narrow blue line on the underside of the hindwing which is wholly wanting in the present species. The hindwing of the two species differs entirely in shape also.

Described from several examples in the collections of Hofrath Dr. L. Martin and in my own, taken in July and August, 1894.

13. *SIMISKINA PROXIMA*, n. sp., Pl. S, Figs. 19, ♂; 20, ♀.

HABITAT: N.-E. Sumatra.

EXPANSE: ♂, 1.45; ♀, 1.50 inches.

DESCRIPTION: *MALE*. *UPPERSIDE*, both wings deep black, with rich dark iridescent emerald-green markings, which are lighter in

* *Massaga pediada*, Doherty, Journ., A.S.B., vol. lviii, pt. 2, p. 430, n. 62, pl. xxiii, fig. 15, male (1889), from Mergui.

shade in some lights than in others. *Forewing* with a dot towards the outer end of the discoidal cell touching the subcostal nervure ; a lengthened streak from the base of the wing posterior to the cell placed against the median nervure, anteriorly narrow, posteriorly broad, crossed by the black first and second median nervules ; a large triangular-shaped spot in the middle of the submedian interspace, posterior to which is an inwardly oblique streak ending on the inner margin, but not extending as far as the base of the wing ; three increasing subapical streaks ; six submarginal spots, the three anterior ones lengthened, the two following circular, the posteriormost round and the largest. *Hindwing* with the costa broadly pale ochreous ; a lengthened basal streak in the submedian interspace, joined outwardly to the innermost of three large triangular discal spots ; these latter have their apices directed towards the outer margin of the wing ; beyond these on the outer margin are three lunular spots, the anal one the largest and enclosing a spot of the black ground-colour. **UNDERSIDE**, *both wings* dull reddish-brown, strongly glossed throughout with dull violaceous. *Forewing* with a narrow dark line closing the cell ; an irregular narrow discal dark line from the costa to the submedian nervure, beyond which the ground-colour is paler ; a broad dark outer-discal fascia, its inner edge blurred, its outer edge more distinct ; beyond which again the ground-colour is paler. *Hindwing* crossed by an irregular broad discal paler area, which bears a prominent narrow dark line across the disco-cellular nervules, and a double series of dark spots, of which the two in the median interspaces of the outer series are the largest ; the outer margin also paler, bearing two narrow lunulated dark lines, prominent at the anal angle, becoming obsolete anterior to the third median nervule ; an anteciliary dark ferruginous line, inwardly defined by a very fine black line. **FEMALE**. **UPPER-SIDE**, *both wings* shining smoky-brown. *Hindwing* with a very narrow anteciliary blue line, becoming obsolete towards the apex of the wing. **UNDERSIDE**, *both wings* pale brown, with markings of a darker brown tinged with castaneous ; the basal area of the wings dark brown, the outer edge of this area sharply defined. *Forewing* with a broad wedge-shaped discal area, broad on the costa, narrow on the inner margin, closely followed by a narrow irregular line ; the outer margin broadly dark brown. *Hindwing* with an inner discal broken narrow

band ; followed by a discal series of spots placed between the veins, the anteriormost the smallest, rapidly increasing in size to the fourth spot in the second median interspace, which is the largest, the spots again decreasing in size to the abdominal margin ; an outer discal series of irregular spots extending across the wing, followed immediately by a narrow whitish and then a narrow black line ; three diffused black spots on the margin in the submedian and median interspaces ; very narrow white, black, and ferruginous anteciliary lines.

Male nearest to the same sex of *Simiskina potina*, Hewitson,* from Singapore (*Hewitson*), Penang, Malacca (*Distant* as *Simiskina fulgens*), Myitta, Tavoy District, Burma (*Doherty*), Hills north of Papun, December ; Thaungyin Valley, February ; Daunat Range, January, all in Tenasserim, captured by Colonel C. T. Bingham ; and Perak (*coll. de Nicéville*), from which it differs on the upperside of both wings in having all the markings rich emerald-green, instead of "rich blue varying according to the light ;" in having an extra dot in the cell of the forewing ; and the underside of both wings having the ground-colour reddish-brown glossed with violaceous, instead of "rufous-brown" with no violet gloss. The female is nearest to *Simiskina pharyge*, Hewitson† (see *ante*, page 29), from the same sex of which it differs in the forewing being narrower, the hindwing more deeply scalloped, the tooth-like projection at the end of the third median nervule much longer, in possessing a blue anteciliary line to that wing on the upperside, but entirely lacking it on the underside ; the markings on the underside differing greatly in detail. It is also near to the female of *Simiskina phalena*, Hewitson‡ from Singapore (*Wallace*), and Upper Burma (*coll. de Nicéville*), from which it differs on the upperside of the forewing in the absence of the discal white spot. The markings of the underside of the two species are very similar, only that in *S. phalena* there is a discal pure white band, which in *S. proxima* is of the pale colour of the ground. It should be noted that whereas *S. potina* has a female which is orange-coloured on the upperside marked with

* *Massaga potina*, Doherty, Journ., A.S.B., vol. lviii, pt. 2, p. 481, n. 63, pl. xxiii, fig. 3, male (1889), from Tavoy, Burma.

† *Simiskina pharyge*, de Nicéville, Journ., Bomb. Nat. Hist. Soc., vol. vi, p. 361, n. 12, pl. F, fig. 11, female (1891), from Perak.

‡ *Simiskina phalena*, de Nicéville, Journ., Bomb. Nat. Hist. Soc., vol. ix, p. 270, n. 8, pl. O, fig. 13, female (1895), from Upper Burma.

black, the female of *S. proxima* is totally different, being smoky-black above; but the females of both *S. pharyge* and *S. proxima* are alike in the colour of the upperside.

Described from a single male obtained at Bohorok in September by Dr. H. Dohrn's collector, Herr M. Ude, and from a female without precise locality, both specimens in the collection of Hofrath Dr. L. Martin.

14. SIMISKINA PROCOTES, n. sp., Pl. S, Fig. 21, ♀.

HABITAT : N.-E. Sumatra.

EXPANSE : ♀, 1·4 inches.

DESCRIPTION : FEMALE. UPPERSIDE, *both wings* fulvous, the base dusted with black scales ; a broad black marginal band, its inner edge scalloped. *Forewing* has the black border broader at the apex of the wing than elsewhere ; the disco-cellular nervules defined by a narrow fuscous line. *Hindwing* with a narrow marginal deep ochreous line. UNDERSIDE, *both wings* pale ochreous, with darker ochreous markings ; the discoidal cells defined by a narrow line ; a somewhat broken inner-discal line, slightly outwardly curved in the forewing, commencing near the costa, ending at the submedian nervure, in the hindwing greatly curved, commencing on the costa, ending on the abdominal margin ; a broader and paler outer-discal band, its inner edge somewhat diffused, its outer edge sharply defined ; closely followed by a very narrow line, straight in the forewing, lunulated in the hindwing. *Hindwing* has a marginal very narrow whitish line outwardly defined by an equally fine black line from the tooth-like projection of the wing-membrane at the termination of the third median nervule to the anal angle ; the outer margin finely dark ochreous.

Nearest to the same sex of *Simiskina potina*, Hewitson, described from Singapore (*Hewitson*), Penang and Malacca (*Distant*),* Tavoy and Thaiping, 1,000 feet, Perak (*Doherty*), and in my own collection from Perak, from which it differs in the apex of the forewing not being produced as it is in that species, the black border to the

* *Simiskina fulgens*, Distant, Rhop. Malay., p. 450, n. 1, pl. xlii, fig. 3, *female* (1886).

forewing being much narrower at the apex and not continued broadly along the inner margin, the hindwing having a well-defined outer black margin, the underside having the ground-colour much paler, pale ochreous instead of "rufous," and the inner and outer discal lines being very much closer together.

Described from a single example taken at Bekantschan, N.-E. Sumatra, on 9th July, 1894, in the collection of Hofrath Dr. L. Martin.

15. *AZANUS ASIALIS*, n. sp., Pl. S, Fig. 22, ♂.

HABITAT: Battak mountains, N.-E. Sumatra.

EXPANSE: ♂, 1.0 inch.

DESCRIPTION: MALE. UPPERSIDE, *both wings* dark shining purple of the same shade as in typical species of the genera *Nacaduba* and *Lycænesthes*. *Forewing* with a narrow outer black margin. *Hindwing* with a marginal series of rounded black spots placed against an anteciliary black thread. *Cilia* of both wings black obscurely tipped with white. UNDERSIDE, *both wings* pale brown, with darker brown (almost fuscous) markings outwardly defined with white. *Forewing*, the discoidal cell with a short basal streak lying against the subcostal nervure; a very large spot or fascia crossing the middle of the cell obliquely inwardly and ending close to the submedian nervure; a large spot closing the cell; a catenulated discal band of six spots, of which the penultimate spot in the first median interspace is widely separated from the fourth spot, being shifted inwardly towards the base of the wing; a submarginal wavy white line; a marginal lunular white line, each lunule enclosing a spot of the ground-colour. *Hindwing* with three prominent large deep black spots, two placed in the costal interspace, and one in the first subcostal interspace; three spots across the base of the wing; a round spot in the middle of the cell, joined to a similar one in the submedian interspace; a large spot at the end of the cell; an irregular discal series of spots; a submarginal wavy white line; a marginal series of seven round spots each encircled by a white line, the first and fifth the largest and deep black, the sixth and seventh the smallest and geminated. *Cilia* of both wings whitish with an anteciliary fine black thread.

This is a very distinct species, and to be identified from all the known species in the genus at a glance. It is nearest to *A. jesous*,

Guérin,* but the coloration of the upperside is quite different, being dark shining purple, while *A. jesous* is "pale purple-blue." The details of the markings on the underside are also very different, especially the small round spot in the middle of the cell of the forewing in *A. jesous* is developed into a large oblique band extending far below the cell in *A. asialis*; the discal band is also different, in the latter it is formed of conjoined rounded spots, in *A. jesous* there are no spots at all, the band being formed of two parallel whitish lines. In the hindwing there are three prominent costal spots in *A. asialis*, in *A. jesous* there are only two, the one in the first subcostal interspace being small and inconspicuous in the latter species. I might here note that *A. jesous* has recently been procured in Upper Burma at Myingyan and in the Lower Chindwin Valley, which is a new locality for it. It appears to occur over a greater portion of Africa.

Described from a single example in the collection of Hofrath Dr. L. Martin, taken in July, 1894.

16. NACADUBA NANDA, n. sp., Pl. S, Fig. 23, ♂.

HABITAT : N.-E. Sumatra.

EXPANSE : ♂, 1.0 to 1.1 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* pale lavender-blue, of the same shade as in the common *N. atrata*, Horsfield; with a very narrow outer black border as in that species. *Forewing* with the costa very narrowly black, the black outer border slightly widened out at the apex. *Hindwing*, the three anal interspaces bear a prominent anteciliary white thread as in *N. celestis*, de Nicéville; tail black, tipped with white. UNDERSIDE, *both wings* greyish-brown, the markings thin, very prominent, and pure white. *Forewing* with a pair of lines crossing the discoidal cell about its middle and reaching the submedian nervure; a pair of lines at the end of the cell; two or three costal white dots anterior to the latter; a discal pair of lines from near the costa to the submedian nervure, strongly fractured and shifted inwardly towards the base of the wing at the second median nervure; the

* The following species appear to be synonyms of *A. jesous*, Guérin :—*Lycena gamra*, Lederer; *Azanus crameri*, Moore; and *Lampides agave*, Walker. Captain E. Y. Watson informs me that *Lampides sigillata*, Butler, placed by me as a synonym of *A. jesous*, is quite distinct from that species.

margin bears three white lines, the two outer ones are straight, the inner one is lunulated, the two spaces of the ground enclosed by these three lines are darker than the rest, thus giving the impression of a double series of dark spots divided by the veins and defined on both sides by a white line, the outer series of spots elongated, the inner series lunulated. *Hindwing* with the usual basal and discal markings; the marginal markings as in the forewing, except that the first median interspace bears a large oval deep black spot surrounded on all sides except the one touching the outer margin by a ferruginous line, the black spot outwardly bears a crescent of metallic green scales; a few similar scales touching the submedian nervure in the submedian interspace. *Cilia* throughout brown, unspotted.

Certainly nearest to *N. atrata*, Horsfield, from which it differs in its average smaller size, in the presence of the anteciliary white line on the hindwing on the upperside towards the anal angle, and markedly on the underside by the white markings being narrower and more prominent owing to their pure, instead of sullied, white colour. In *Iris*, vol. i, 1888, Herr J. Röber has described "*Plebeius*" *illuensis* (p. 64, pl. iv, fig. 30, *male*; 31, *female*), from Ceram and Aru, and *P. dobbensis* (p. 65, pl. v, fig. 19, *male*; pl. iv, fig. 34, *female*) from Aru, but though they appear to be closely allied to *N. nanda*, they both seem to lack the white anteciliary anal thread to the hindwing above in the male, and to have the white markings of the underside broad and sullied as in *N. atrata*.

Described from several examples in the collection of Hofrath Dr. L. Martin and my own.

N.-E. Sumatra appears to be very rich in species of the genus *Nacaduba*. Of species with the basal area of the forewing on the underside unmarked it possesses *N. pavana*, Horsfield; *N. macrophthalmia*, Felder; *N. kerriana*, Distant; and a fourth species of which I possess a single female only and consequently abstain from naming it till I can obtain the opposite sex. Of species with the basal area of the forewing on the underside marked with a pair of white strigæ in addition to those on the disc it possesses (tailed species) *N. atrata*, Horsfield = *prominens*, Moore; *N. hermus*, Felder = *viola*, Moore = *unicolor*, Röber; *N. ancyra*, Felder

= *aberrans*, Elwes = *subfestivus*, Röber; *N. nanda*, de Nicéville; *N. nelides*, de Nicéville; *N. ardates*, Moore = ? *nora*, Felder = *kupu*, Kheil; (tailless species) *N. noreia*, Felder; and *N. dana*, de Nicéville. Of all these, the only one that presents any difficulty in identification is *N. noreia*. That species has no tail, and I have always considered it to be a dimorphic form in both sexes of *N. ardates*, Moore. I have both sexes of the latter from Sumatra, but of *N. noreia* only males, unless, as I believe, its female is to be found in a very curiously marked little butterfly which I possess in considerable numbers, all the specimens being obviously females, and there being no males except *N. noreia* to put with them. On the upperside they are of the usual leaden colour, with, in some specimens, a few metallic blue scales on the disc of the forewing. The underside is ochre-yellow or luteous, with, in both wings, a very prominent marginal series of black spots; these in the forewing are of equal size throughout, but in the hindwing the second spot counting from anteriorly backwards and the sixth are larger than the rest; within this series of spots is another submarginal obscure fuscous series. Dr. Martin holds that these specimens represent a distinct and unnamed species, and proposes to call it *N. lutea*, but I am of opinion that they are females only of the tailless *N. noreia*, with which they agree in also lacking a tail. I have figured (Pl. S, Fig. 24,) one of the specimens described above. The female of the true *N. ardates* is so extremely variable in the coloration and markings of the underside that I see no improbability in its tailless form (true *N. noreia*) being equally variable, an extreme form of this variation described above being peculiar perhaps to North-eastern Sumatra, though it is closely approached by some specimens from Burma in my collection.

17. LAMPIDES LACIATEA, n. sp., Pl. S, Figs. 25, ♂; 26, ♀.

L. pseudelpis, Moore (nec Butler), Lep. Ceylon, vol. i, p. 95 (1881); id., de Nicéville, Butt. of India, vol. iii, p. 165, n. 736 (1890).

HABITAT: Ceylon.

EXPANSE: ♂, 1·5; ♀, 1·4 to 1·5 inches.

DESCRIPTION: MALE. UPPERSIDE, both wings pale shining azure-blue of rather lighter shade than in *L. elpis*, Godart; no outer black

border, but with an anteciliary black thread only. *Hindwing* with a fine marginal white thread anterior to the black marginal thread, the latter outwardly bounded by a still finer white thread; on the abdominal margin anterior to the anal angle is a short black line defined on both sides with white. **UNDERSIDE**, *both wings* pale brownish-grey; with three prominent marginal white lines enclosing a series of lunular spots somewhat darker than the ground, the innermost is the broadest, is nearly straight in the forewing, highly lunulated in the hindwing, the middle line is highly lunulated on both wings, the outer line is the narrowest and quite straight; an anteciliary black thread. *Forewing* with the usual four discal white strigæ, the innermost arises from the subcostal nervure, crosses the discoidal cell, and ends on the submedian nervure; the second arises from the upper discoidal nervure, is somewhat broken in its course, and ends on the submedian nervure; there are two white dots on the costa in continuation of these two lines; the third arises on the costa, and runs into the second at the third median nervure, forming with it a Y-shaped figure; the fourth arises on the costa, and ends on the second median nervure. *Hindwing* with the usual basal and discal white strigæ; an oval deep black spot on the margin in the first median interspace, surrounded on three sides by a narrow ferruginous line, bearing at its inner and outer sides some metallic pale green scales; a black spot at the anal angle crowned with metallic pale green scales. **FEMALE**. **UPPERSIDE**, *both wings* pale bluish-white without any metallic lustre. *Forewing* with the apex very broadly black, the outer margin also broadly black, though less so than the apex. *Hindwing* with the costa as far as the second subcostal nervure black; the outer margin broadly black, bearing a series of oval white spots with black centres between the veins, the one in the first median interspace the largest, the one in the submedian interspace linear instead of circular; a fine anteciliary black thread outwardly defined by a still finer white thread. **UNDERSIDE**, *both wings* as in the male, except that the two spaces of the ground-colour enclosed by the three marginal white lines are much darker than in the male, and present the appearance of two series of fuscous spots.

Captain E. Y. Watson has examined the type of *L. pseudelpis*, Butler,* from Malacca, in the British Museum, and informs me that it is

* Trans. Linn. Soc. Lond., Zoology, second series, vol. i, p. 547 n. 9, pl. lxviii, figs. 9, male; 8, female (1877)

indistinguishable from *L. elpis*, Godart (except that it is entirely without submarginal markings on the upperside of the hindwing, these being always present in *L. elpis*),* in which opinion Mr. W. L. Distant concurs, as in Rhop. Malay., p. 227, he treats the species as a "variety" only of *L. elpis*. The Ceylon species therefore which Mr. Moore identified and described, but failed to figure, in Lep. Ceylon, as *L. pseudelpis*, being undoubtedly distinct, requires a name. It is nearest to *L. cleodus*, Felder (= *L. pura*, Moore), from Assam, Burma, Sumatra, Nias, and the Philippine Isles (*coll. de Nicéville*), differing in the male on the upperside in the azure-blue colour being slightly darker, and in both sexes on the underside of the forewing in the arrangement of the discal white strigæ, in *L. lacteata* numbers two and three together form a Y, in *L. cleodus* all four are parallel, the first from the base is long, the second is very short, the third is again long, and the fourth is short, though twice as long as the second. The inner and middle of the three marginal lines differ also, in *L. lacteata* they are highly lunulated, in *L. cleodus* they are straight. *L. malaccanus*, Röber,† from Perak (Malacca) and the Philippines, appears to be an allied species, though more probably it is a synonym of *L. celeno*, Cramer = *L. ælianus*, Fabricius, *auctorum*, but is apparently distinct from *L. lacteata* in having the subanal black spot on the underside of the hindwing very broadly (instead of narrowly) circled with ferruginous, and the marginal lines on the underside of both wings are straighter. *L. osias*, Röber,‡ from the Philippine Islands, is also another apparently closely allied species, but it has the inner of the three marginal lines on the underside of the hindwing much further removed from the margin, and all the discal strigæ of both wings much more attenuated.

L. lacteata appears to be a rare species. I possess two pairs only from Ceylon.

* Perhaps *L. pseudelpis*, Butler, equals *L. kondulana*, Felder, that species certainly occurring in the Malay Peninsula.

† Iris, vol. i, p. 57, pl. iv, fig. 3, male (1888).

‡ Iris, vol. i, p. 56, pl. v, fig. 17, male (1888), = *Lycena amphysina*, Staudinger, l.c., vol. ii, pp. 100 and 164, pl. i, fig. 4, female (1889).

18. LAMPIDES TALINGA, Kheil, Pl. S, Figs. 27, ♂ ; 28, ♀.

Plebeius talinga, Kheil, Rhop. Nias, p. 29, n. 86, pl. v, figs. 32, male ; 33, female (1884).

HABITAT : Nias (*Kheil*) ; N.-E. Sumatra.

EXPANSE : ♂, 1.0 to 1.2 ; ♀, 1.1 to 1.2 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* light metallic azure-blue of the same shade as *L. elpis*, Godart ; the white markings of the underside showing through by transparency. *Forewing* with the costa towards the base of the wing very narrowly black ; the apex widely black ; the outer margin also widely but decreasingly black. *Hindwing* with a marginal series of increasing black spots ; an anteciliary black thread divided from the marginal spots by a white thread ; from the first median nervule to the abdominal margin anterior to the marginal spots is first a fine black, then a fine white, line. UNDER-SIDE, *both wings* pale dull plumbeous ; three continuous marginal nearly straight white lines. *Forewing* with four discal parallel white lines arranged at equal distances apart as in *L. elpis*, the two internal ones spring from near the subcostal nervure and reach the submedian nervure, with two white dots anteriorly on the costa ; the third line commences on the costa and ends on the second median nervule ; the fourth line commences on the costa and ends on the third median nervule. *Hindwing* with the usual basal and discal lines ; a large rounded black spot in the first median interspace surrounded on three sides by ferruginous, bearing at its posterior inner corner a few metallic green scales ; there is also a small clump of similar scales on the margin in the submedian interspace placed on a black spot, which latter is crowned with ferruginous. FEMALE. UPPERSIDE, *both wings* of a paler shade of blue than in the male with no metallic lustre. *Forewing* with the whole of the costa narrowly black ; the apex and outer margin with the black border twice as wide as in the male. *Hindwing* with an inner rather broad marginal lunulated black line, then a prominent more or less rounded series of black spots defined on both sides by a white line, then an anteciliary black thread. UNDER-SIDE, *both wings* as in the male.

Although this species bears a strong superficial resemblance to the widely-distributed *L. elpis*, I believe it to be quite distinct. It is much smaller ; the black border of the male on the upperside of the forewing is actually wider than in any specimen of *L. elpis* in my

collection, though *L. talinga* is so very much smaller an insect, while this border is proportionally also wider in the female; and on the underside of the forewing in both sexes there are two costal white dots anterior to the two internal white strigæ, which are never found in *L. elpis*. N.-E. Sumatra is very rich in species of this genus, the following being represented:—

Both sexes, underside, forewing with two costal white dots.

1. *L. celeno*, Cramer (*celianus*, Fabricius, *auctorum*).
2. *L. cleodius*, Felder = *L. pura*, Moore.
3. *L. saturata*, Snellen.
4. *L. talinga*, Kheil.

Both sexes, underside, forewing with no costal white dots.

5. *L. elpis*, Godart.
6. *L. kondulana*, Felder = *L. cærulea*, Druce = *pseudelpis*, Butler.
7. *L. subdita*, Moore.
8. *L. margarita*, Martin.
9. *L. bochides*, de Nicéville.
10. *L. abdul* (*abdula* in Index of plates to Rhop. Malay.) Distant = *marakata* Doherty.
11. *L. lucide*, de Nicéville.

Of these, the two latter are excessively rare. The discovery of the fact that *L. abdul* (which was described from a female specimen which I have examined at Dresden in Dr. O. Standinger's magnificent collection, and has a broader black margin on the upperside to both wings than any other species known to me), should have a male with an equally broad black margin but with the base of the wings of a metallic green of a peculiar shade—a feature unique in the genus—is most interesting.

L. talinga is quite common in Sumatra where it occurs. I possess seven males and nine females, while Hofrath Dr. L. Martin has also numerous examples.

(To be continued.)



From a Photograph by Mr J.D. Inverarity

Mintern Bros. lith. London.

THE INDIAN WILD BUFFALO
Bos bubalus



From a Photograph by Mr J. D. Inverarity

Mintern Bros. Lith. London.

THE INDIAN WILD BUFFALO

Bos bubalus.



from a Photograph by Mr J D Liverarty

THE INDIAN WILD BUFFALO.

Bos bubalus

Mintern Bros. Photo. Imp. London.

THE INDIAN WILD BUFFALO.

BY J. D. INVERARITY.

(With Plates A, B, and C.)

(Read before the Bombay Natural History Society on 19th Sept., 1895.)

There are said to be two varieties of Indian wild buffalo—the one with straight horns turned up at the end (*macrocerus* of Hodgson) and the other with horns which curve round and approach a circle in shape (*spirocerus* of Hodgson), and Forsyth says that those found in the Central Provinces belong to the latter variety. My experience is entirely confined to the buffalo that inhabit the sal forests in the Central Provinces. I can see no difference between some of the heads procured from that part of India and heads which come from Bengal and Assam. There is a great variety in the form that the horns of the Central Provinces' buffalo assume, as will be seen by reference to the plates that accompany this paper.

Before referring further to them, it will be convenient to give the measurements of the horns there depicted. Plate B is drawn on a smaller scale than Plate C.

			Length round curve.			Distance between tips.
Plate A	...	...	3' 8"	...	...	4' 1"
„ B No. 1	...	...	3' 10"	...	...	4' 2"
„ B No. 2	...	...	4' 9"	..	...	2' 11"
„ C No. 1	...	...	4' 1"	...	...	1' 4 $\frac{1}{4}$ "
„ C No. 2	...	...	3' 5"	...	...	4' 0"
„ C No. 3	...	...	3' 8"	...	...	2' 9"

A scale of a foot is shown on plates B and C, which will enable any one to check these measurements. No. 1 on plate C is 8 inches longer than No. 2, though No. 2 to my mind is the finer head. There is no scale to plate A, but the distance between the tips, 4' 1", will serve as a scale. Plate A represents a typical specimen of a solitary bull—the points of the horns being more perfect than usual.

No. 1 in plate B is the head of a solitary bull. I have several others of similar shape which appear to me to resemble exactly heads I have seen from Bengal and Assam.

No. 2 in plate B adorned a very large bull in a herd; they are unusually long horns for a Central Provinces' buffalo and are compara-

tively smooth. They are rather thicker in reality than they are drawn on the plate.

No. 1 in plate C was a herd bull, and the only old bull I ever shot with horns so nearly approaching a circle.

No. 2 in plate C is a very common type of a solitary bull's head. This one when first seen by me was with a herd. When disturbed, but not fired at, he left the herd and went off by himself.

No. 3 in plate C is a common shape for a young bull's head. This one was an old bull and the horns are very thick ones—the width of the horn at the base is 8 inches and 23 inches in circumference. The horns grow very close to each other at the base, the distance between the horns at the top of the skull being only 4 inches, the normal distance at that spot being 7 to 8 inches. He was in a herd.

The plates B and C do not sufficiently bring out the deep and rugged indentations on the horns which are characteristic of an old head. They are well shown on plate A.

The horns of the cow-buffalo do not vary so much in shape as those of bulls. The majority even of old cows resemble in shape No. 1 on plate C, though they are very much thinner. Occasionally one sees a cow with a fine length of horn when the shape is not unlike that of No. 2 on plate B, the horns however curving in more. I never fired at cows when I could help it after I had got two good cows' heads, but I am certain that, as a rule, in the Central Provinces the cow's horns are not so long as the bull's. The longest cow's horns I have measure in length 4 feet 2 inches. The longest cow's horns I ever saw are a pair in the museum at Marseilles, which measure 5 feet 3 inches. I think (if there are two varieties of wild buffalo) that the opinion of Forsyth that only the spiral variety is found in the Central Provinces is erroneous. The horns there vary much in shape; the animals bearing them are found in the same herds; and beyond the shape of the horns there is no difference observable. I am inclined to think that there are not two varieties of wild buffalo if such variation is based, as appears to be the case, on difference in shape of horn. Jerdon says that the horns of the spiral variety are rarely much more than three feet in length.

In the Central Provinces horns of four feet, or an inch or two over, are quite common. I have shot several just under or just over four feet. Old rugged heads, like that of No. 2 on plate C, are about $3\frac{1}{2}$ feet.

In the Natural History Museum at South Kensington there is a head, of which the horns are 5 feet $7\frac{1}{2}$ inches in length, and a single horn measuring 6 feet 6 inches. Such giants are not found now-a-days.

In Baldwin's "Game of Bengal," p. 139, there is figured the head of a cow-buffalo which is quite unlike the shape of the cow's horns in the Central Provinces. The buffalo, though by no means so blood-thirsty and dangerous an animal as he is generally described to be, charges sufficiently often to render his pursuit on foot pleasureably exciting. In fact, I think, he is more likely to charge when unwounded than any animal I know. When wounded, individuals vary much in character. Some very old solitary bulls I shot never made any show of fight, though in very favourable ground for them; others charged at once with great determination. If an unwounded bull means business, he will come towards you as soon as he sees you, perhaps, from two hundred yards off; he comes slowly walking or trotting, stopping occasionally to make threatening demonstrations with his horns. You stand your ground, getting behind a tree if one is handy. Sometimes on getting within fifty or sixty yards of you, he will suddenly turn and bolt, but if he does not, he comes on at a good pace with his nose in the air and his horns lying back till he makes his final rush when he lowers his head. Every one must please himself when to fire. I prefer to wait till he is close to, as a shot in the brain is the surest. It is difficult to hit the brain while his head is up. Another thing is that the buffalo dreads the report and smoke of a gun at close quarters, and is very likely turned even if the bullet does not hit the proper place. If a charge is delivered in long grass or dense jungle, you have no time to think of anything, as the bull will not move till you are within a few yards. You hear a crash, see a buffalo all horns almost on you, and have to bang into him without time to put in practice any theories you may have formed to meet such contingencies. A cow with a newly-born calf is a dangerous animal if you happen to pass near where she is, but she is not actuated by any malicious motives. I was sorry once to have to shoot one in self-defence. On another occasion, I was glad to be able to avoid this. As I was walking through the jungle I heard a buffalo bellowing loudly about half a mile off. I had

never heard a buffalo bellow before nor have I since ; and on making for the spot whence the noise proceeded, I came to an open glade of short grass, and saw in the jungle on the opposite side, a hundred and twenty yards away, what I first thought was a solitary bull, but soon saw was a cow. As I stood looking at her, she saw me and at once came straight for me full speed. I waited till she was thirty yards off and was just about to fire, when she suddenly pulled up on the brink of a small rift in the ground, out of which a newly-born calf, that I had not seen before, came. It looked quite yellow, being covered with light hair. I think it could only just have been born as it walked in a tottering fashion. The calf went to its mother, who then turned round and walked slowly away across the glade, stopping every few yards, uttering low grunts of encouragement to its young one which with difficulty followed it. They disappeared into the jungle, and I then departed in the opposite direction. A herd of buffalo never charge, sometimes they bolt in the direction you are if they don't know where the shot comes from, and there is a slight chance of being run over. If they see you, they turn off. A solitary bull I followed for three days, and that I put up several times in long grass close to me, and fired at half a dozen times, wounding him on the first and second day, did not charge me. I did not know better then, and so fired at his stern, all I could see whenever he got up in the grass. On the third day I lost his tracks after going for several hours without coming up to him, and on this day four villagers happened to pass the clump of bushes he was in. He charged them and drove one horn into a man's ribs and the other through the palm of his hand splitting the hand up. I did not hear of this for four days as my camp was a long way off. I went to the place, and heard that the bull had been seen that day near the river by an old woman going to get water. My advent was hailed with joy as the villagers about were naturally afraid to go out of the villages. Next morning I soon found the tracks of the bull. Two village dogs accompanied me and I found the bull was evidently in a bad temper, as here and there we came on bushes and ant-hills levelled to the ground by his horns. After tracking some miles the dogs went into a thick clump and began barking, and I then heard the buffalo chasing them about. It was too thick to see anything. I was standing about ten yards out-

side waiting to see something when the bull poked his head out and looked at me. I was afraid to fire, as his head was in a very awkward position for the brain shot. While I was wishing myself well out of it, he drew back his head and I then heard him galloping clean away. I felt rather a fool. I tracked for five hours more before I came up to him in open tree jungle. When I fired he charged at an ant-hill and began knocking it about with his horns, which enabled me to run up close and kill him. The ant-hills made by the white ants stand several feet high, and I suppose he thought it was his enemy. My old shots, about half a dozen in number, were in his stern. This was a lesson to me, which I afterwards profited by—not to fire unless you can hit a vital spot. A wounded buffalo after a time gets very mad and goes for any one as his wounds make him feverish and cross. The horns of this one had long thin points as sharp as needles. The wounded man eventually recovered, but he could not open his hand, as the fingers were all contracted. Another bull that some one else had previously wounded gave me some trouble. The wound was close to the tail and was full of maggots. Any buffalo with an old wound unhealed in him is pretty sure to charge. Mr. G. S. Chatterton, who was Superintendent of Police in Chanda in 1886, was killed by a buffalo in that year. He had been shooting with me in 1884, and was then using a Winchester repeating rifle. I advised him to get a more powerful weapon, and when he met his death he had a 10-bore. The story of his fate was told me by Chief Constable Bajerao who was with him at the time. He wounded the buffalo one day and went out the next day after it. Several bad omens (according to Bajerao) occurred as they went along. First, a snake crossed their path, then Chatterton's pony stumbled and fell as they crossed a nullah, and one or two other events of evil import, which I now forget, also happened. Bajerao told me that at these different warnings (as he considered them) he entreated Chatterton to go back. However, they went on and came on the buffalo lying under a tree, and they at first thought it was dead, but seeing it was alive, Chatterton fired his 10-bore; the buffalo charged and drove a horn right through his chest. Death must have been immediate and painless. Throwing him off his horn the buffalo rushed at him again and ripped the arm. Bajerao fired and the buffalo at once charged him and was killed with a shot through the head at the last moment. Poor Bajerao himself

met afterwards with a sad fate. He accompanied me tiger shooting for several years, and was the pluckiest and staunchest native I ever met. When with me in the hot weather of 1892, he was seized with cholera, and in spite of all I could do died in my presence, forty-four hours after being first attacked. I hope to meet him again in the next world.

Colonel Gerald Martin many years ago was mauled by a buffalo in Assam. He was not shooting, but was out surveying, and I believe was squinting through a theodolite when a bull charged him. He was severely pounded by the animal's head and feet, but escaped being prodded with the horns as he held on to them. He informed me that as the animal butted him against the ground, the points of the horns striking the ground prevented him being squeezed quite flat. Many other similar instances have occurred which show that a buffalo is a queer customer. I remember an instance of a herd of wild buffalo attacking and goring to death a young tame buffalo that was tied out for tiger. They happened to pass the place where it was and killed it.

Tracking and shooting buffalo is very similar to the same mode of shooting bison. I used to go out soon after dawn and stop out all day riding through the jungle until tracks were found. When you come on fresh tracks you dismount and track until you come up to the animal. I have never seen them in water. A wounded bull once took a bath in a water hole while I was following him, and when I came up to him he was covered with wet mud. I have often seen them caked with mud and their horns covered with mud too. The sal forest jungle along the Jonk river is quite dry hard ground, not marshy ground, such as one reads of in Bengal. It is well broken up with nullahs, and there are in most places plenty of sal trees and the ground is fairly open. The buffalo drink either at the pools in the river, or at the village tanks. They go miles from any water, and I do not think they drink every day. One I have already mentioned as having followed for three days, drank at night at the village tank within thirty yards of my tent. I took his tracks from there, and during the three days I followed him he never went to water, though no doubt on the third day he drank as, though I never reached the spot, he got to the river that day. I lost his tracks early in the afternoon. The ground is much easier walking than bison ground, and the shooting is altogether easier, as buffalo when disturbed do not go nearly so far as

bison do. As you go along on the tracks, it is necessary to keep wide awake in any long grass or thick patch of jungle the tracks lead through, as if a solitary bull is sitting down, you may almost walk on to him. I can remember one occasion when the bull got up so close I could nearly have touched his tail ; he stood stern on looking round at me. I fired for behind the ear, but the cartridge missed fire. *Steterunt que comæ, et vox fancibus hæsit*, which the undergraduate translated, "My hair stuck in my throat and my jaws stood up on the top of my head." The bull, however, ran away and I followed and killed him. He is the one depicted in plate A.

I generally found that I came up again to a solitary bull, which had bolted, in an hour or two, and I have frequently followed a bull and started him half a dozen times before I could get a satisfactory shot when he kept to thick jungle or long grass. In open jungle you can usually get your shot the first time. Buffalo are easily killed with one shot if you hit them in the right place, which is low down behind the shoulder or through the brain. I soon found the folly of firing into the middle of their carcasses and of taking long shots. Buffalo are very easily stalked and you can always, if a good stalker, get to within fifty yards and often to within twenty or ten yards of them. You should go alone, leaving your men behind ; a second gun is no use, as you have no time to use it if he charges, and if he does not charge you have no need of it. The first thing to learn is that a well-directed shot at the root of the tail will not blow his brains out, whereas a shot through the lungs will kill him before he has run a hundred and fifty yards. If you see the points of a buffalo's horns showing above the grass he is lying in, the safest way of shooting him, whether he is wounded or not, is to judge from the position of the horns which way he is lying and then make for his head. He will let you get within a few yards ; when he rises, his head is facing you and gives you an easy shot to the brain ; a 500 express rifle, in my opinion, is the best for this particular stalk and shot. If you walk up towards his tail when he rises, he either goes off, showing no vulnerable spot, or he swings round so as to look at you, and I find myself that this sudden swing round is trying to the nerves and makes one unsteady. In following a wounded bull into long grass or thick jungle, when you do not know exactly where he is, a 500 express is rather small ; an 8-bore gun is

better, both because it gives a much more knock-down blow and because the roar of the report is louder, which I believe the buffalo does not like. I latterly always used a 500 express by Henry, lead bullet with steel plug and $4\frac{1}{2}$ drams of powder, when I was going to fire at a buffalo at my ease, at close quarters, and if I hit the right place behind the shoulder, the animal never wanted another shot; the express even with an ordinary bullet with a copper tube in it is quite fatal for the head shot. On the other hand, it must be admitted that a 12 or 8-bore is better for a charging shot in thick jungle, where you cannot take any particular aim. The bullet should be spherical; one part of tin and twelve parts of lead. Such a bullet, whether propelled by 9 drams from an 8-bore or $4\frac{1}{2}$ drams from a 12-bore, will go through the body of a buffalo and lodge under the skin on the opposite side, where it will be found hardly altered in shape. I only remember once a bullet going through the skin on the opposite side.

I have with the express dropped a charging bull with a shot through the head that did not touch the brain. It was too low, and passed beneath it hitting the vertebrae of the neck. No doubt, if you fire anyhow at a buffalo, he will take a lot of shots, but if you get quite close and hit him properly, he succumbs just as easily as any animal. The latter method is the safest; though at first one rather funks going close up, you soon lose that feeling as you get confidence in yourself. Some places, where the trees have been cut down for cultivation and abandoned, are extremely thick with the shoots that spring from the roots of the trees. It is no exaggeration to say you cannot see a yard. These are nasty spots to follow a buffalo into. Occasionally I have heard the buffalo I could not see striking the ground with his fore feet in anger in one of these places. The sound has a sonorous metallic ring about it. On pushing into a buffalo that was doing this, he bolted and I never got him, as it happened that heavy rains had swollen the Jonk river to a raging torrent, two hundred yards wide, running like a mill race. The buffalo swam across and I could not follow him. I did not see him swim, as he had got over before I got there. But the tracks led down the river bank straight into the water which was several feet deep where the buffalo had plunged in. He had previously swum a nullah full of water.

Numbers of buffalo are killed by cattle disease. I was told at a village that a solitary bull drank at the village tank every

night. Next morning there were no fresh tracks at the tank though the old tracks were plentiful. I went off to look for him, and having found his fresh tracks, came up to him, in the course of time, lying on his side with a crow on the top of him—he was quite dead. There was no wound on him and he was quite fresh, having died only a few hours before. He was a small bull and had apparently been afflicted with diarrhœa. There are two kinds of solitary bulls. One, an old one, with a rugged head ; the other, a young one with small horns, not worth shooting. You cannot always tell from the tracks whether the bull has a good head or not, and it is rather dispiriting after a long track to come up to a bull not worth shooting. The same thing occurs in tracking a herd. There is often no bull worth shooting in it. At first, of course, all heads look enormous, but when you know what a good head is, there is no satisfaction whatever in killing an inferior head. I once tracked a bull from 6 a.m. to 5-30 p.m. before I saw him and then let him go as not good enough. Strange to say, I picked up this one's tracks a mile to the west of my tent. He made a long round, and when I saw and left him he was to the east of my tent, and my tent was in sight. I had no idea where I was and fancied I was miles away. The length of this track was, I fancy, occasioned by my having commenced on a track of the previous evening.

That tigers occasionally attack buffalo is certain. An old solitary bull I shot was deeply scored on the rump by the claws and teeth of a tiger that had fastened on him behind. The wounds were not healed. Another time when tracking a herd I came on the freshly-killed and partly-eaten carcase of a calf about eighteen months old that had been killed by a tiger. The tiger probably had seized it as it lagged behind, as there were no signs of the herd being alarmed, the tracks proceeding leisurely onwards. I returned to sit over this carcase in the evening, but in the mean while the vultures had eaten it. I moved the remains a few yards into an open spot and placed alongside them the fresh head of a solitary bull I had shot that day ; but the stupid tiger when it came just after dark walked to the place where he had left the kill, gave two or three sniffs and grunts and walked away. I do not think tigers have much sense of smell. If you move a kill a few yards, the tiger when he returns and does not

find it at the exact place he left it walks away and hardly ever seems to be able to find the kill if it has been moved out of sight.

Two bulls are often found together ; they are almost always small heads not worth shooting. Large herds of twenty or more have generally one very good bull with them. The old solitary bulls too seem sometimes to have a herd they join. I have, when tracking a solitary has left it bull, found that he has joined a herd, and when again disturbed, he and gone off by himself. I have also found an old bull with a herd which he left when he saw me and ran away in a different direction to the one the herd took. I shot a solitary bull not far from the Udanti river that inhabited a rocky stony country, where no other buffalo were, and the people there told me he had been there for four years alone.

Buffalo, though not partial to hills, will cross low ranges, and I saw one once that had taken up its quarters for the day on a hill side. It is true the hills in which he was were quite low ones. As his head was a poor one I left him. I have never tried shooting them from horseback. Once I rode a large herd that were out on a plain, without any offensive weapon in my hand, and quickly overtook them. When I got about eighty yards from them, they suddenly stopped and wheeled round and stood. I sheered off without stopping to ask any questions, and they after standing some minutes resumed their flight.

The bulls appear to fight a good deal. I shot an old one that was covered with wounds. One of his horns was broken off, so that some inches of the bony core on which the horn grows was exposed to view. He was in a dreadful state ; large holes in his quarter where he had been prodded from behind were full of maggots. There were other wounds in front and a long wound across the face. One of his hind legs was ripped to the bone from the fetlock to the hock, and the horn of one of his heels was knocked off. He was very emaciated and would probably have died soon.

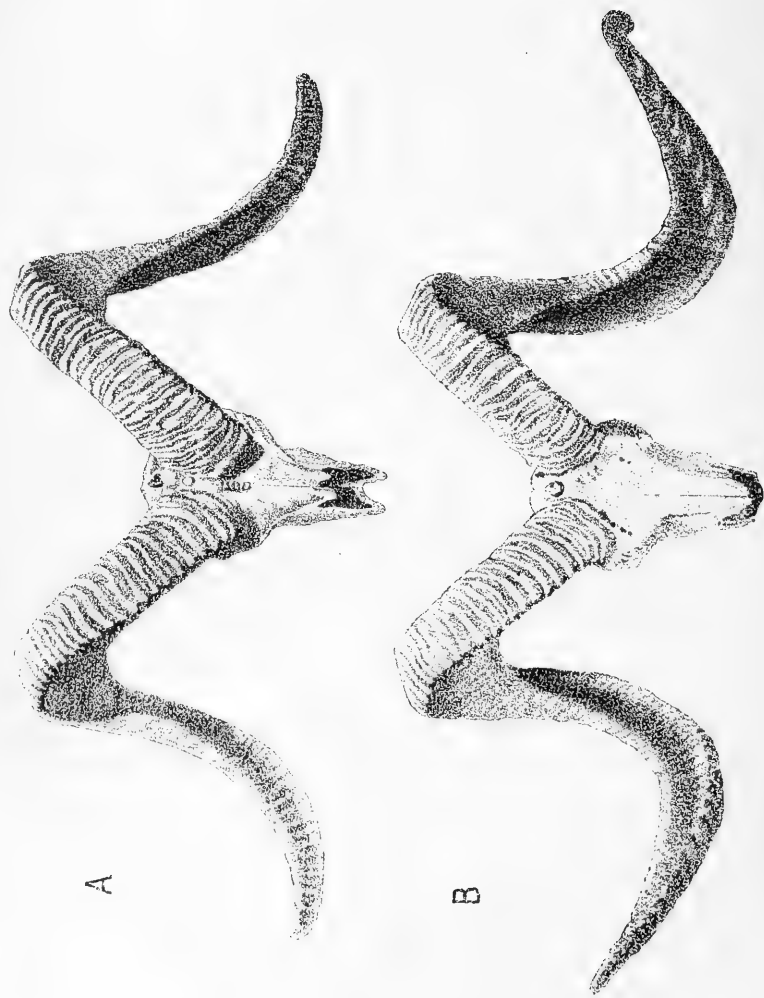
Colonel Ward shot an old bull with horns very like those of No. 2 on plate C ; one of the horns, bony core and all, was broken short off within a foot of the head. The enormous force required to effect this can be imagined. I also saw a cow half of whose horn and bony core had been snapped off. Pieces are chipped off the horns too in fights. The right horn of No. 1 on plate B has a large flake knocked off. The left horn of No. 2 on plate C has a large piece knocked out at the

back of the horn, but you cannot see this in the front view. Of abnormal heads I have only seen two—one a bull whose head is figured at p. 125 of vol. I of this journal. The distance between the tips of the horns of this head is 5 ft. 1 inch. It looked when alive like a huge lop-eared rabbit. I had a very long tramp after it seeing it several times, and eventually shot it through the eyeball. He was a solitary bull, and when I first saw him he ran towards me, made threatening gestures with his horns, and just as I thought he would charge, turned and bolted unfired at. The other was a cow. One horn grew straight down the cheek and was a short stump with a blunt end. Another solitary bull I killed was covered with white spots all over the size of half a crown—some sort of skin disease I presume. Buffaloes frequently rest lying flat on their side with their legs stretched straight out. The first one I saw in this posture I thought was dead and was surprised when he jumped up. If you shoot a buffalo in a herd and he runs a short distance before dropping, or if he sits down wounded, the rest of the herd always pull up and stand looking at him. They pay no attention to you, and you can easily get close up to them again, but as there is seldom more than one bull worth shooting in a herd, this is of no practical importance. If buffalo see you and you remain standing perfectly still with your legs close together and arms close to your side, they will stand staring at you for ever. Bull No. 2 on plate B and the herd with him saw me when I was two hundred yards off. I remained quite still, and after a very long time they began to sit down; the bull sat down last of all, and just as I began to move, up he got and took another long look. He then sat down again, and when he sat down he was hidden by a fringe of long grass, close behind which the herd had lain down. This enabled me to creep to about ten yards of him when his fate was sealed. Wild buffaloes are much larger than the tame buffalo and have more hair; their legs are a dirty white, beginning from just above the hock and knee, in this respect being similar to bison. A large bull stands 5 ft. 6 inches or a little more at the shoulder. I measured one to be 5 ft. 8½ inches. Baldwin says that they are occasionally a few inches over 6 feet!! Jerdon says their height is up to 6½ feet. I do not think so. I should say that they weigh considerably more than a bison does. I have heard members of a herd gently grunting to each other as they moved along, but only once,

as I have remarked before, heard one bellowing. When a bull starts to charge he generally gives a loud snort, and this is rather useful as it attracts your attention to the spot he is coming from. When tracking a wounded bull it is necessary to remember that he may take a turn and lie in wait for you on one side of what appears to be his route. Once a bull I had wounded let me pass him and charged me from behind.

Buffalo have no fear of approaching the villages. They come to the village tanks to drink. In the hot weather one sleeps in the open, and twice when I woke in the morning I found that a solitary bull had, during the night when I was fast asleep, passed close to my bed, to drink at the tank on the banks of which my tent was pitched. Another morning at dawn as I opened my eyes they fell on a large herd of upwards of twenty buffalo crossing the village fields, three hundred yards off. I went after them at once just as I was, but they fled before I could get near the bull. When I resumed operations, after returning to my tent, to get clothed and have the morning meal, the herd split into two portions and after a time the bull left the herd. He went a very long way and I did not see him till the afternoon when he got up close to and ran away, and I did not come up to him again, so I never fired a shot at him. What looked like a certainty in the morning resulted in complete failure. During the rains, when the crops are growing, the buffalo sally forth into them and do a lot of damage and are with difficulty driven away. I am told they charge sometimes on these occasions, and I saw a native who had had a horn driven through his jaw and cheek by a bull he was trying to frighten away from the crops. Nielghai are often seen feeding along with a herd of buffalo. On one occasion I was in some long grass in the middle of a herd trying to find the bull, when a fine stag swamp deer jumped up at my feet and made off. I missed him, and was nearly run over by the herd bolting. Buffalo produce their calves in March, April, and May, and I believe at other times of the year also.

One of the charms of buffalo tracking is that you get shots at other animals as well. Tiger, bear, bison, sambar, swamp deer, cheetul, nielghai, four-horned antelope have all been shot by me when so engaged. I have also seen panther, but missed them. There are few places where bison and buffalo can be shot on the same ground. I have been lucky enough to kill them on the same day.



From Photography.

Ovis polii

A. Length $4\frac{1}{2}$ " Round the base. $15\frac{1}{2}$ " Tip to Tip $43\frac{1}{2}$ "

SHOOTING *OVIS POLII* ON THE PAMIRS.

BY BARON EDMOND DE PONCINS.

(With a Plate.)

(Read before the Bombay Natural History Society on 18th July, 1895.)

The first time I saw that gigantic sheep the *Ovis polii* was just after entering the Pamirs on the northern side. We had crossed the Kizil Hart Pass early in the morning, and leaving my caravan with orders to remain near the Kizil Kul frozen lake, I went with a guide to look for *Ovis polii*. The man was not at all a shikari, but like all these nomads, was more or less acquainted with the "arkar's" habits (the native name of the *Ovis polii*) and he could take me to the ground and back to camp, which was all I wanted. After crossing the Kizil Hart we turned to the west and began to follow the ridge of the mountain. It was grand scenery and made one feel lonely. The mean height over the sea was about 15,000 feet, and as far as the eye could reach it was always and only white snows, and white mountains outlined against the sky. The valleys were flat deserts of pebbles, without any sign of life, not even any grass. In some places were dark rocks protruding from the long rolling plateau. Everything was silent desert, a dead country and a country of death; that is the common aspect of the north of the Pamirs and the true *Ovis polii* ground.

After a long time we came to a broad nullah running all along the foot of snow fields and glaciers. There we stopped, the ponies were left behind, and slowly we climbed the ridge commanding the nullah. Right in front was a white mountain, one of the largest in the Transalai chain and, if not the Kaufman peak itself, one of the neighbouring peaks. There about half a mile off, on a rounded spur, between the snow fields, on a little patch of grass the game was in sight. Six arkars were quietly feeding and moving about. Hoping that they would soon lie down for the day-time, as mountain game nearly always does, I waited and watched them. I had lost my glasses in the Kohistan mountains—a most terrible loss—and I had to depend upon my eyes only. I could see them from time to time, now lying down and now getting up again. In some places they were scratching the ground and raising clouds of dust, and at twelve in the day they showed

no signs of resting, so it was useless to wait any longer, and although the wind was in the wrong direction, I tried a long turn up the valley to stalk them. When after about two hours' hard work on the stones and ice I came to the proper place, the arkars had got scent of me and were not to be seen anywhere. Shortly after, however, I saw them, in single file, going up the mountain along a snow ridge, the big ones first and two young ones behind. They were going at a long canter, stopping from time to time as if to regain breath, and I lost them, always going up as if to climb the Kaufman peak itself. They were certainly over 18,000 feet. I could plainly see from the ground that they often came to this spot; in many places were big forms where they had laid down, after scratching the ground, and some big heads lying about attested that for years certainly this place had been a favourite one.

On the morrow I went to look for arkars in the next nullah. My camp was to be pitched on the Kara djilga river, which flows into the great Kara Kul, and I went between this river and the Transalai chain. I saw many this day. The first was a young one which went off at once as soon as he saw our ponies and crossed a high ridge at about 15,500 feet. Following him we could see from the top about six arkars in a flat valley very far off, and soon after, and nearer to us, a good herd of about thirty. They were in a very bad place to stalk, but seeing they were going up slowly, feeding along a little rivulet where there was some grass, I decided to wait for them to come nearer, or to see where they would go for the middle of the day. I could not see if there were any good heads amongst them, but I wanted food for my camp, so I thought it was not a day to be very particular about good or bad heads, so I made up my mind to shoot what I could. After a very long wait I got above them and could see some young ones standing and walking about in the middle of the herd, while all the big ones were lying down. It was impossible to get nearer, so, although it was about 400 yards off, I decided to shoot. One big one was lying on the ground like a dead beast with its four legs stretched out, I shot at him but missed, and off they all went at a terrific pace downhill. They had hardly disappeared when two of them came back to the top of a little hill, as if they wanted to have a good look all round. but they went down again and followed the herd. Soon after I saw the herd in the middle of the plain below, all in single file. From

time to time they stopped and crowded together. One would canter in front of the herd, another one would follow, and then the whole herd went off—again in single file. As they were heading to the snows it was useless to follow them, so I tried another place. Passing near two small lakes, in the middle of rather broken nullahs, I came to a small river and higher up found a good patch of grass. Here were tracks of the game, some quite fresh, and we began to look sharp all round. Soon after a herd of about ten was seen at full gallop on a ridge, and after they had disappeared I went to try and see where they were going. Shortly after I saw them, twenty-five altogether. They had stopped in a rather steep place and were just beginning to lie down. I took the ponies down a nullah out of sight, and leaving them to feed came back to my game. At once it was easy to see that it was impossible to stalk them, but as there was no grass to be seen anywhere except where I was, I thought the best plan was to wait for them to come and feed. As long as the arkars did not move, they were out of reach, but at the first move they were bound either to go to a place where they could be easily stalked, or to come towards me. I crouched down and waited, watching the game until they should move for their evening feed. It was then about half-past two. The height was some 15,500 feet and the wind rather cold. All in front of me and going right down the slope where the game was, was a granite plateau, nearly level, with here and there small boulders, about one or two feet high. I could plainly see the *Ovis* about 500 yards off. They were not sleeping, but kept their heads erect and from time to time got up to stretch their legs, and then lay down again.

At about half-past three, very far off, in the west, I saw seven arkars on the snow. An inspection of the ground made me think I had a better chance to get a shot at the first herd than at these seven new comers, so I decided to leave them alone and came back to my first place. There was something going on in the herd. One female got up and stood motionless, then another, then a third, and in about two minutes all were standing. They had a quiet look for about three minutes and then began to come down-hill, right on my side.

As there was a narrow little nullah right under the arkars, and as they had to cross it to come nearer, I began to rise on my knees and creep towards them, keeping always the last of the herd in sight so

as not to be seen. Soon after I was on the level plateau going on all fours, from boulder to boulder, thinking that the nearer I could get to the edge of the nullah the better. Just as I came to a stone about one foot and-a-half above ground, I saw the white front of a female arkar coming out of the nullah; then one after the other they all emerged into the plateau. The slightest movement and everything would be lost. I kept motionless, and as my grey coat was exactly the colour of the surrounding stones, I hoped I should not be seen provided I kept perfectly still. The arkars were now about 250 yards off, and beginning to feed on some little white flowers scattered amongst the stones. For some minutes four or five of them kept looking steadily towards me, but I kept as motionless as the granite itself and they went on feeding again. The two big males were a little out of the herd, but one female was going in front as if leading the lot. The young ones were playing together, running round and round after each other, jumping sideways like lambs, standing on the top of stones and turning round on their hind feet, butting at each other. After looking at my game for about half an hour, I saw it was time to shoot. They were quite near enough, and resting my rifle on my felt hat on the top of the stones I took a careful aim at the ram on my side and fired. As soon as the smoke cleared off I saw the legs of the brute in the air. The others went off like lightning to a distance of about fifty yards, then all crowding altogether turned to look towards me. I raised myself on my knees, but was dizzy for a minute, having kept so long in a cramped position and so could not get a shot at the second ram. Off they went in single file, a female leading; 200 yards further on they stopped again to look at me and then disappeared over the verge of the plateau.

I counted 120 paces from where I stood to the ram—a close shot indeed. My bullet had gone through the base of the left horn and broken the skull just at the nape of the neck. As the arkar was feeding when I fired his head was low and I aimed too low, but there it was, my first *Ovis polii*—a grand brute, twelve hands at the shoulder, with moderate horns. The skin at this time of the year (26th June) is in bad condition, patches of wool being mixed with the rough and shorter hair of the summer coat. It was a finely-shaped brute, with the face, legs, and under parts nearly white and all the back and

middle of the body grey, darker on the back and getting lighter down the ribs. Each hair is marked with white and black rings like a porcupine's quills. We cut off the head and hind legs for food and returned to the camp.

Another day, not far from this same nullah, I spent a very long time in search of *Ovis*, hoping to shoot a good ram, as the day before I had killed a female, and we consequently had plenty of meat in camp. After many hours we saw a herd of eleven rams going through a broad valley to a narrow nullah in the middle of snowy peaks.

As it appeared to me that it was impossible for them to get out of this nullah except by a very high pass, over newly-fallen snow, I thought it probable they would stop there, so I went after them. We passed by the foot of a big and very broken "glacier" coming from the Kaufman peak, and shortly after began to ascend the said nullah. Just when we were engaged in a difficult place we saw the arkars again. They were not so far as we expected, but hearing the stones rolling they saw us and went on up-hill at a good canter. We were at about 16,000 feet; the ponies were done for, and one of my guides was disabled by mountain sickness; so I left him with the ponies and went about 500 feet higher to have a good look at the whole nullah. Right below was a tiny little lake with a patch of grass close by. All round were stony slopes, very steep indeed, under awfully high peaks. There was practically no exit from such a place even for an *Ovis polii*. We had a long inspection of the ground and finally discovered one *Ovis* coming slowly down near the lake. Shortly after there were three in sight. It was impossible to see if they had good horns, but I thought arkars which lived in such a secluded place must be wary old males, so I decided to go after them.

The descent by some long sheets of ice and over rocks was not at all easy, but we got to the bottom of the nullah at last. Soon after we discovered an *Ovis*, about 700 yards off, looking at us from a spur. He went off at once and there were the eleven rams running down-hill. It was evidently the same herd we had been after all the morning. This time they galloped at full speed, crossed the valley, went up the left side of it and disappeared over a high rocky spur. Evidently they were going back to the next big nullah, where we had seen them first. The only plan was to try and follow the river, and as

a reward I soon afterwards sighted the eleven rams feeding quietly about 500 yards' distance. The ground was a long undulating slope broken up by little ravines, and after creeping along on all fours for some time I saw the game 200 yards distant. At the first shot they made a move and stopped, intently looking all around as if they did not know where the danger was. My shot had been too high; the second shot too high again, and at once, all the herd made straight for me. Unhappily they were following a little ravine, and as they passed about 100 yards under where I stood, I could see only the tops of their backs. Two more shots missed. I saw that if I were on a ridge about 180 or 200 feet higher, I should possibly see them in a nullah they were just entering, so I ran my best and reached the top to see all the brutes in single file going up, under my feet, about eighty yards off. But I was breathless; running up-hill at 15,000 feet is not easy for a man, hardly for an *Ovis polii*. My heart was beating frantically and my hand was anything but steady. I tried to rest my hand on the ground and fired. The first shot missed, but the second rolled over an *Ovis*; the third missed, but the fourth killed one more. I tried two more shots, about 150 or 180 yards distant, but only wounded another, and there I was half fainting without any more cartridges. For about half-an-hour I was unable to move, so exhausted was I after such exertion. Eventually I got back to camp with two good heads thinking I had done very badly.

It is by no means an uncommon occurrence for game when misled by an echo, or by the bullet striking against stones near them, to make straight for the spot whence the shot is fired; especially is this the case with mountain game.

On one occasion I was shooting at two young males and fired four times at the bigger of the two. At each shot I saw that the bullet struck the ground just behind the brute, but he kept on running a few steps up and then down-hill, looking in every direction, evidently not knowing what to do or where to go.

I need not narrate all my adventures with *Ovis polii*, but it may interest sportsmen to know which places I found the best.

On the west of the Kara Kul lake and south of Kaufman there are *Ovis* and sometimes in greatherds. Over the great Kara Kul, at the Akdjilga sources, I saw one herd of females and young ones numbering about 120.

The valleys of the Gouroundi and Sassik rivers, west of the Akbaital river, hold some *Ovis*. They are not common in summer all along the Aksu, but the neighbouring hills on the northern, eastern, and southern sides of the great Victoria lake, are full of *Ovis*.

When I got there from the west after a long and useless search near the Yashil Kul I had a spell of bad weather. A snow storm obliged me to stop and wait for several days on the Karasu river. But as it was bitterly cold and snowing hard, I thought the game would come down into the valleys, and so they did. One day from my tent I could see a herd of about 120 on the hill close by. Everything was covered with snow and they were moving slowly down. I went to watch them, but could not find anything worth shooting amongst the whole lot, so I left them alone. Another day on the south side of the great Pamir lake, I left my camp in very bad weather, the wind was blowing hard and the snow falling. It was bitterly cold, and it was almost impossible to see as the clouds were low everywhere, except from time to time for a few minutes. But it was a grand day as the game was swarming. I saw certainly 600 *Ovis* that day and came back with five heads tied to our saddles—the grandest day of sport I had in my life. We went all day without eating, as we had nothing. The weather was so bad we had not been able to light a fire for four days; but the arkars were lower down and it was an opportunity not to be lost. I saw one herd of twenty-three big rams together, but they saw us when the clouds opened all at once and went away at a rattling pace over the plain. I visited several nullahs and had to cross a ridge about 17,300 feet—the most trying thing I have ever done—although I went higher sometimes, but the wind was on this occasion blowing straight in our faces. The clouds were so dense that it was impossible to see more than a few feet in front, and the cold was terrible. I thought we should have had to give up and die on the pass, but as soon as we had crossed it, we felt warmer as the wind was neither so strong nor so cold a little lower down. After crossing this pass I made a right and left at two big rams, so we were fully rewarded.

Near the Benderski pass there are some *Ovis* and all along the Tagdumbash on the north side, but the Hindukoush is too difficult for them and there is not a single one south of this chain of mountains.

As a rule, *Ovis polii* are not at all fond of difficult and rocky mountains. Their true ground is the long rolling plateau or the

rounded hills of the Pamirs. I never saw one in a really bad place. They are not very wary, but often difficult to stalk on account of the ground. A close shot is a rare occurrence, and 200, 250, or 300 yards is the usual common range.

They are commonly found at a height from 18,000 up to the snow, the little patches of grass along the snow lines over broad stony nullahs being their favourite resorts. They feed in the early morning and keep moving about until 10 or 11 in the day ; then they lie down, sometimes on the same spot, or oftener they go up some bare hill where they scratch the ground and make a sort of big form. I did not notice that they are at all fond of lying on the snow. I nearly always found them in very dry places or on the stony slopes. It is not easy to see them when they are not moving about, and when standing they look very light coloured except on the back.

When lying down arkars nearly always keep the head erect as if on the look-out, and when sleeping they lie with the neck outstretched. I saw big males with heavy horns resting their horns on the ground. In this case the under parts of the neck and jaw do not touch the earth by some inches. The animal cannot touch the ground except with its mouth on account of the shape of the horns.

They seem to be affected by height. I more than once saw *Ovis* when going at full speed up-hill, open their mouths as if in want of breath. When going up-hill they never go very fast and stop from time to time. When going leisurely they do not mind heights over 17,000 feet. I saw some coming down for food on the sky line at certainly more than 18,000 feet. When disturbed they go up slowly but steadily to great elevations. As a rule, they dislike snow and are very cautious when in deep new snow. I once saw four *Ovis* repeatedly try a glacier covered with new snow, not more than 400 yards from me. It was wonderful the way they avoided the bad places. The one in front went very slowly trying the ground, and every now and then went shoulder deep into the snow. He then drew back and tried other places without success and then saw me. I was going up hoping to cut off their line of retreat, seeing which they appeared to be puzzled for several minutes, and finally, instead of crossing the plain, came straight towards me at full gallop and passed eighty yards off. I got one and the others disappeared.

After keeping very quiet all day, about three or four o'clock they go again to feed. Once I saw three males fighting on the way to the grazing ground. They were butting each other exactly as sheep do, and sometimes ran alongside each other striking sideways against the ribs and flanks. The points of the horns being at right angles with the line of the neck, they must hurt each other in this way much more than when knocking their heads together. When engaged in such a fight they utter a kind of low grunt, and the noise of the horns against each other can be heard a long way off. They do not move about at night except when disturbed.

One has to be very cautious when watching *Ovis polii* as they have excellent sight and are wonderfully keen scented. If they see anything they all stand looking at it, crowding against each other and striking the ground with their fore feet, often coming some paces nearer. All at once one bounds away, all the herd follows, and before long all stop again and turn to look at what has disturbed them. Then they start again and stop again, sometimes every two or three hundred yards. Even after you have shot at them they behave in this way, but if once they get scent of you they are off directly without stopping until they are a great distance.

I saw once a herd going at full speed, and when I fired at them from a ridge about 400 yards off they stopped at once. When the bullet struck the ground on the further side of the herd, they all started and went to look at the place where the bullet had struck. Soon after they went off again, but they had not seen me.

They nearly always resort to the same places and the same nullahs. Big herds always consist of females and young males. When about five years old the males herd together in small numbers of two or three, sometimes more, but hardly ever exceeding eight or ten. Once only I saw twenty-three. These herds of males spend the summer in the highest and most remote nullahs, but in winter they come lower down and many die of starvation in the spring, when, after a bad winter the food runs short. One can see on the ground many heads of old *Ovis* which died in the spring. In some places they are to be seen by dozens, and by the more or less decayed condition of the horns and skulls, one can guess how long they have been lying on the ground. During the summer there is not a single big male to be

seen near these places where the horns are found, and it is evident that they only come in winter.

I think the weight of a good big ram's head is nearly forty pounds. I got one which is 71 inches long and $15\frac{1}{2}$ round the base. The sinew which runs down the nape of the neck is quite as big as a man's wrist. Such a sinew is necessitated by the weight of the head. When galloping they have a peculiar way of keeping the head quite erect; this is certainly due to the great weight of the horns which would be felt much more if the head were kept straight out. All the same, they go very fast indeed down-hill, and their gallop is a long stride even when going up-hill; but I noticed more than once what a peculiar stiff action they have in the shoulder which is due to the way they carry their heads.

It is very difficult to make out which is the best amongst several rams, the shape of the horns being such that in profile it is impossible to see them well, and when seen from the front one can only make out how broad they are from tip to tip, and that very roughly.

When stalking these animals the golden rule of never approaching from below but always from above is of great importance. They do not mind going up or down-hill* and will cross a valley of more than a mile in breadth when disturbed. When shot at much they go off great distances and leave the country. I do not consider that they are hard to kill considering their size. A 500 express is quite enough for them. Mine was a double barrel 500 magnum, shooting five drams of powder and a hollow bullet about one inch long. I found it was a capital weapon for *Ovis polii* and other game.

Some sportsmen and naturalists have tried to make out that there are numerous species of these giant sheep, but I am strongly of opinion that in Central Asia there are only two species, viz., the *Ovis polii* and the *Ovis ammon*. The shape of the horns of the former species does vary slightly, and it is interesting to compare the two heads shown in the accompanying plate. It will be seen that in one case the horns touch each other at the base, while in the other they are a considerable distance apart, but both these heads came from the same district (south-east of the Victoria lake) and there is no doubt that they are of the same species.

* Some mountain game when disturbed go up-hill, but the *Ovis* does not. What they do is to get out of the way by the easiest road.

FIELD NOTES WITH THE CHITRAL RELIEF FORCE.

BY MAJOR W. ST. J. RICHARDSON, F. Z. S.

(Read before the Bombay Natural History Society on 18th July, 1895.)

Though most of the country passed through by this expedition is somewhat barren and singularly devoid of life, I have here jotted down a few of the most common birds or animals that came under my notice whenever there was time enough to make notes.

From Nowshera to Murdan is, I suppose, too well known to require description. The road crosses the Kabul River on a bridge of boats, and passing through some low bare hills, proceeds in almost a direct line to Hoti Murdan. As the station is approached, the cultivation increases, watered by a canal that comes down from the Swat River. In the barley fields about the end of April, I believe there is some of the best quail-shooting in India. The commonest birds are the English starling, common mynah, the golden oriole, the raven, and the ubiquitous crow. The next stage from Hoti Murdan to Jalala is uninteresting in the extreme, over bare open plain; a little barley cultivation round Jalala village; birds very few. Small fish are to be caught in the stream here, but I did not see any. I am told that they are a sort of mahseer, and they run readily at a very small fly-spoon. The road next passes towards the hills through barley cultivation, and about fourteen miles the village of Durgai is reached. I noticed the imperial eagle and one of the common harriers on this march.

Durgai is situated at the foot of one of the spurs that run down from the Malakhand Pass. Here the road became extremely difficult. Going towards the foot of the pass I saw some chikor. The hills here are sparsely covered with korindah and other bushes, and probably hold a few hares and black partridge, but I saw neither. At the top of the pass, height 3,540 feet, there are groves of wild olives, the commonest bird being the oriole. There are also chikor on the rocky hills round. We now get down into the Swat Valley; cultivation, still keseel (or bearded wheat) very plentiful, trees in topes and very uncommon on the hills, which appear almost bare. A few quails in the wheat, and I observed snipe, gadwall and teal on the river near Aladand. I also saw among the groves of trees a

small pigeon of a greenish-bronze colour, but I did not shoot one ; so am unable to identify it. In the river there is very good mahseer fishing, the best runs being towards Aladand and almost opposite Chakdara. Many fish were killed, the biggest 23 lbs., all with a spoon. When I was in the Swat Valley about the 7th April, the river was fairly clear, though the water rose every afternoon owing to the melting snow ; but I should say that little fishing could be done there after the third week in April. I am told that chikor, seesees, and black partridge are to be found on the lower slopes of the hills enclosing the Swat Valley. After crossing the Swat the road lay up the valley to Uch and then through the Katgola Pass. The hills over which we passed were covered with wild mint ; a few pine trees were to be seen for the first time, walnuts and chinass being abundant. On some of the hills there was considerable cover of wild roses and korindah bushes, but I was told that beyond a few black partridge and chikor there was nothing on the hills. At Serai (first called Gunbat) there were a good number of black partridge and hares about. Here the road lay downwards through the Shamshi Khan Pass on to the Panjkora River. Few birds were to be seen but the common stone-chat and the king-crow. In the Shamshi Khan Pass we first came upon a species of holly which covers the sides of the hills in the Barant, Dir, and Kunar Valleys. At Sado on the Panjkora River there were a few quails in the cultivation and I put up one jack snipe. The Panjkora is a very rapid stream, and as it comes straight from the snows, it is at this time of year (15th April) very dirty. A few trout were taken with atta and a worm, but they were mostly under half a pound. No doubt in the season there would be very good mahseer fishing.

There is cultivation along the banks of the Ushiri River, the whole way to Mundia Khan (now called Mundah), the Fort of Umra Khan in the Jandoul Valley, and which is situated on the Jandoul River, a tributary of the Ushiri. Here we managed to get some very good fishing, mahseer being killed up to 22 lbs. while I was there, and since I hear of one weighing 40 lbs. There are some splendid runs, and no doubt many fish come up the Ushiri when the Panjkora is so thick. Most of the successful fishermen used a silver spoon about 2" to 2½" long, but I got five fish weighing 43 lbs., biggest 18 lbs., on a 1½" gilt fly-spoon. The oriole, king-crow and common mynah with the wire-tailed swallow

were the commonest birds to be seen, though, of course, those camp-followers, the Egyptian vulture and the common kite, were fairly numerous. I found a nest of the wire-tailed swallow in the fort at Mundia containing four eggs hard set.

The road from Mundah to Kanbat at the foot of the hills is more or less uninteresting. Passing through open country and crossing the Jandoul River several times, I noticed here the imperial eagle. On the top of the Janbatai Pass, 7,400 feet, we first came across the lammergeyer, which was to be seen sailing over the tops of the hills covered here and there with snow. The north side of this pass is covered with pines, deodars, walnuts, horse-chestnuts and the holly before mentioned. There were a couple of peregrine falcons hunting the side of the hill as we descended. There is good water about 100 yards below the summit and a camping ground on the very top, though of limited dimensions. The common red-start was to be seen here, as well as a bunting of some sort which I could not identify. The Baraul Valley from Janbatai down to Chutiatan is covered with walnuts, mulberry, pear and peach trees, and with wild raspberries and currants growing here and there. Wild violets and strawberries were common, while in some parts the ground was covered with a pink and white crocus. Pink and white mar was also to be seen. To the south of Baraul Bandai is the Kargossa Pass, about 8,450 feet, and I was informed by the natives that on the hills surrounding the pass there were to be found bear (black probably), thar, apparently, (they described it as a large deer with horns), and the musk-deer. When the stream clears, there is probably fair fishing in the Baraul River, though I doubt whether you would ever get a fish over, say, 10 lbs. As it is not a big stream, the snow trout is caught in large numbers running from 3 lbs. to a few ounces, mostly about $\frac{1}{2}$ lb. In the higher part of the Baraul nullah there is wheat cultivation, but as we approach the Panjkora River the hills come straight down to the water, and the river becomes faster and more rocky. At this point the road turns north up the Dir Valley, and at six miles from Chutiatan the Fort of Dir is reached. Here we were encamped some time, and the only amusement was catching trout in the Dir stream, which is very rapid and comes down from the Lowarai Pass. These fish seem to be the ordinary Himalayan or snow-trout, and, as before said, run up to about 3 lbs., though such a fish

is very rare. On the hills around there is thick cover, mostly hilly, but the natives say that beyond a few chikor there is nothing but a few barking deer on them. The Dir Valley continues upwards for about thirteen miles till Goojar is reached at the foot of the pass. Our camp there is in a bleak rocky spot amongst the snow drifts from the summit, and when, as is generally the case, a cold wind blows off the pass, the cold is something intense. The top of the pass is reached in about $3\frac{1}{2}$ miles and is about 10,450 feet high. The birds noticed were the mynah fairly common, the chough, hoopoe, yellow wagtail, snow bunting (?), spotted dove, nuthatch, swift, the English swallow, crow, woodpeckers, especially the golden-backed woodpecker, kestrel, lammergeyer, crested tit, and great tit, English cuckoo, very common, minivets, and a bird rather larger than a greenfinch—the name of which I do not know—the head and breast were claret-red, back, wings and tail olive-brown. I thought at first it was a cross-bill, but as it was perpetually on the move, it was impossible to see its beak clearly. There was also another bird found first below the snows; it had a harsh scream like a jay, the head was black, the rest of the body dark brown, bowed with white; it had a longish tail and was somewhat larger than a bulbul. On these hills are to be found bear, probably red and black (a small black bear was shot, above Goojar), musk-deer in considerable numbers, markhor, thar and goorah—so they say; but I was over the hills for two days, and all that I saw was one goorah and some female thar. This is, I fancy, a bad time of year, as the grass is springing up on the melting of the snow, and the Goojars come with their cattle and goats and swarm everywhere. They say there are koklass at Goojar, but I did not see any; a bird, I think, identical with the English black-bird, is found along the torrents that run down from the hills, as well as the pied wagtail, water-ouzel or dipper and the red-start. The road from the top of the pass to Ziarat at about $3\frac{1}{2}$ miles is mostly cut out of the side of the hill, but after passing Ziarat it descends into the river-bed and continues crossing and recrossing the stream till Ashreth is reached about six miles further on. There is little to be said of this camp; it is at an elevation of about 6,000 feet, but is sunk in between high hills in a narrow valley; there are a good many walnut trees, but it is very hot and the flies are something fearful. Three miles beyond Ashreth, Mirkandi

is reached on the Kunar or Chitral River. The road here turns north-east and keeps along the cliffs high above the Chitral River until we come to Killa Darosh about fourteen miles from Ashreth. The Kunar is a very rapid and deep river ; there were two bridges over it but they were both destroyed by Umra Khan. There seemed to be some grand runs in it, but it is probably clear for only a short time in the year. When we saw it about the middle of May, it was a dark slate colour. The birds noticed on this march were the kestrel, cuckoo, chikor, rock pipit, large verditer fly-catcher, pied and grey wagtail, blue rock-pigeon, red-backed shrikes, crow, raven, and golden oriole ; the last very common. In one tree I saw no less than five birds. On this march I saw an albino blue rock ; it was almost white with the blue bars on its wings clearly marked ; it passed close below me and I could see it very clearly. Killa Darosh is a rather pretty little village almost hidden in walnut and mulberry trees, the latter, two sorts—the white and red—being ripe, abundant ; beautiful water coming from streams in the hills. Beyond Killa Darosh, which is twenty-six miles from Chitral, I did not go ; but I am told that about Chitral there are oorial and on the hills markhor. I forgot to mention that on a tomb at Ziarat there were several markhors' heads ; they are of the Kashmir variety ; the biggest was, I believe, 50", but I did not measure it ; there was also a pair of horns at Ashreth, probably about 40".

LIST OF SNAKES TAKEN IN TRAVANCORE FROM 1888 TO 1895.

BY H. S. FERGUSON, F.L.S.

(*Read before the Bombay Natural History Society on 18th July, 1895.*)

Seven years ago I began collecting snakes systematically for the Trevandrum Museum, and, by the aid of friends in the hills, and my own and a native collector's exertions in the plains, have got together so far some sixty species. Of these, three are new to science and have been described by Mr. Boulenger in the pages of this journal, and have been, or will be, figured there also. They are *Rhinophis travancoricus*, *Rhinophis fergusonianus* and *Dipsas dightoni*, the latter named after Mr. Dighton of Pirmerd, to whose exertions and to those of Messrs. Richardson, Turner and Marshall I have been mostly indebted for specimens from Pirmerd, the High Range, and Ponnudi respectively. It is difficult to say much about the habits of the various species, for nearly all are nocturnal, and, when one does come across one in the day time, all one can do, as a rule, is to capture it without delay, so that it is not often one has the chance of watching snakes in their own haunts under natural conditions. The first snake I saw in this country was a few days after I landed. I was sitting in the verandah of a house in Madras when my attention was drawn to a frog, which had just hopped on to the road close by; in a second it was followed by a snake that seized it and at once commenced to swallow it. The friend, with whom I was staying, and I ran out and intently watched the performance, which proceeding appeared to cause the snake no anxiety, when suddenly there was a sound of wings, and snake and frog soared away in the grasp of a Pariah kite. Imbued as I was at that time with the common but erroneous notion that "cobras are found every day in your slippers," and other snakes to be met with at every turn, I was not at all surprised at the occurrence, but I have since learned to modify this opinion and have never again been present at such a veritable "chain of destruction." The fact is that unless you search for snakes, and that with diligence, you hardly come across a single stray one from year's end to year's end. To return to Travancore. There are eight species of *Silybura* recorded by Colonel Beddome (who, when at the head of the Forest Department in Madras,

did so much to extend the knowledge of these and other earth snakes) which should be found in Travancore. Of these we have secured six, and it is possible we may yet come across the other two, for these snakes are very local and are not easy to find at any time though, when one has been met with, others of the same species may generally be found near the same locality.

Family TYPHLOPIDÆ.

These are small worm-like snakes, which are entirely subterranean in habit and can only be obtained by digging. In excavating a tank in the public gardens I got a number, but with a single exception all of one kind.

Typhlops braminus. Fairly common in Trevandrum.

Typhlops porrectus. { This has only been recorded from North
India hitherto ; but a single specimen was
brought to me and is now in the British
Museum.

Family BOIDÆ.

Python molurus.—This is a fairly common snake about the foot of the hills. Specimens are often brought in alive for the zoological collection in the public gardens (at present we have three, but none over ten feet). The largest I have heard of was one of eighteen feet killed on a coffee estate in the Ashambu hills.

On one occasion I was considerably startled by one. I was walking from one coffee estate to another, when I took a wrong road and coming to a stream I sat down and took my breakfast. Before retracing my steps I took a nap and suddenly woke to find a python gliding along within a yard of me. Needless to say I hurriedly departed in the opposite direction. One was killed not long ago near the regimental butts at Quilon, which are close to the sea ; it was about eight feet long and had killed a kid.

In captivity, as a rule, they feed well, but one we had fasted absolutely for a year and ten days. Contrary to what I have always believed, I find that they will eat a *dead* rat, or rabbit, just as readily as a live one. They make no attempt at constricting it but proceed to swallow it at once. At one time all the pythons that were kept in a particular cage died, and a *post mortem* examination showed that they

were infested with internal parasites in the form of round worms, which in most instances had perforated the intestines and the coating of the stomach.

Family UROPELTIDÆ.

These are burrowing snakes which feed upon worms. When cutting new roads on coffee, or tea estates, they are often met with. They may also be seen above ground after rain, when they follow the worms to the surface. Mr. Marshall told me that he found one one day struggling with a worm almost as large as itself. They are called by the natives "double-headed snakes."

Rhinophis sanguineus.—I have only taken one specimen at Ponmudi at about 2,000 feet elevation.

Rhinophis travancoricus.—Also a single specimen taken about six miles from Trevandrum. It was described by Mr. Boulenger in Vol. VII of this journal.

Rhinophis fergusonianus.—A single specimen taken by Mr. Sealy in the High Range ; also described by Mr. Boulenger.

Silybura maculata.—Five specimens have been sent to me from time to time from the High Range, and from that locality only.

Silybura ocellata.—As I have said above, all the *Silybura* are very local, and I received no specimens of this snake for some time till seven were sent to me in one consignment by Mr. Richardson from Pirmerd.

Silybura rubrolineata.—I have received this from localities from the foot of the hills to the High Range.

Silybura myhendræ.—Five specimens of this snake have been taken, two of which were from the very foot of the hills, the other three from the hills of South Travancore. It has not been recorded from the High Range.

Silybura madurensis.—Five specimens, all from the hills of North Travancore at considerable elevations.

Silybura brevis.—This is by far the commonest of the earth snakes. I have taken it in the Pettah in Trevandrum, and it is found commonly in the hills at all elevations, both in North and South Travancore.

Melanophidium punctatum.—I have only received two specimens of this snake, both from Pirmerd. It is a most beautiful snake being highly iridescent.

Platyplecturus sanguineus.—This is only found at high elevations. I have it recorded from the High Range and Pirmerd.

Family COLUBRIDÆ.

SERIES A.—AGLYPHA.

Xylophis perroteti.—One specimen from the High Range.

Xylophis stenorhyncus.—One specimen taken at Nedumangad, ten miles from Trevandrum, at the foot of the hills. Thirty years ago this place was well in the forest, but is now more or less open country.

Lycodon travancoricus.—This is a very common snake both in the low country and in the hills and is often found in bungalows. It is mistaken for *Bungarus cæruleus* sometimes, but may be readily distinguished from it by the absence of the hexagonal scales running along the centre of the back. It does not appear to live in captivity.

Lycodon aulicus.—Common in the low country, but I have not recorded a single specimen from the hills; like the above our captive specimens have only lived a short time.

Dryocalamus nympha.—Two specimens only received.

Polyodontophis subpunctatus.—A single specimen was brought to me alive taken in Trevandrum.

Simotes arnensis.—Two specimens taken in Trevandrum. One was brought alive, but did not survive long.

Oligodon travancoricus.—Several specimens of this snake have been sent to me from the High Range.

Oligodon brevicaudata.—A single specimen taken at Pirmerd.

Oligodon subgriseus.—This is a fairly common snake in the hills of both North and South Travancore, less so in the plains, but I have taken it in Trevandrum, and also have it recorded from Cottayam. I have kept it in captivity, but it does not thrive.

Oligodon affinis.—Two specimens, one from the High Range and the other from the foot of the hills.

Zamenis mucosus.—The rat-snake is one of the commonest snakes both in the hills and plains. Mr. Ingleby, the Superintendent of the Public Gardens, writes: "It is about the most active in confinement and next to the python thrives the best; its favourite food is a medium-sized frog, of which a fair-sized snake will eat about twenty-two at a meal. Confinement seems to retard their growth. They

also appear to prefer frogs to rats, possibly because the former are easier to catch. On seizing its prey it immediately begins to swallow it alive, and in a very short time a large number of frogs are disposed of. They are fed once a week. The oldest rat-snake in the Gardens has been in captivity for six years and was taken when quite young."

Coluber helena.—This is a common snake in the hills above a thousand feet elevation.

Dendrophis grandoculis.—A single snake of this species was sent to me from Pirmerd.

Dendrophis pictus.—A fairly common snake both in the hills and plains. Mr. Ingleby writes about those we have had in captivity: "It is a very lively and plucky snake, also a very pretty one when excited. It is very keen after frogs, particularly tree frogs."

Dendrophis bifrenalis.—Mr. Boulenger only records this from Ceylon; it is, however, not uncommon in Trevandrum.

Dendrophis caudolineolatus.—Like the last has been hitherto looked on as peculiar to Ceylon, but a single specimen was sent to me from Pirmerd.

Tropidonotus beddomii.—A fairly common snake throughout the hills above fifteen hundred feet elevation.

Tropidonotus stolatus.—Common both on the hills and in the plains. In captivity it is fond of lying in water.

Tropidonotus piscator.—This is essentially a water snake. It is common in the plains. On Pirmerd there is a peculiar variety having the markings quite different from those of the low country form. In the Public Gardens these snakes used to make a habit of coming into the cages of the water-fowl on the edge of the lake to purloin the fish and often were killed by the herons, but especially suffered at the beak of the hair-crested stork, which took a delight in watching for them.

Tropidonotus plumbicolor.—Fairly common both on the hills and in the plains.

Helicops schistosus.—Two specimens were taken in, or near, Trevandrum. One was brought alive and lived for some months in captivity; though its habits are said to be aquatic, I never saw it go into the chatty of water provided for it, nor did I ever see it "flattening and laterally expanding the skin of the anterior part of the body."

Mr. Ingleby writes : "This is a very fierce snake and does not appear to move about much in the day time. It invariably buried itself in the sand at the bottom of the cage with nothing but the extremity of its head and eyes sticking out. When provoked, it would turn to attack with great fierceness, though the specimen alluded to was not more than a foot long. Unfortunately when the cage was removed to another house it was attacked by ants (*Solenopsis geminata*) the first night and literally skeletonised. It appeared to be in a thriving condition, and might have lived for a considerable time if the ants had not got in. It was fed on small frogs, but was never actually seen in the act of eating though the frogs disappeared."

SERIES B.—OPISTHOGLYPHA.

Dipsas trigonata.—I have taken a few specimens in Trevandrum. It may be sometimes found at night among the branches of rose bushes. I have had it in captivity, but it does not thrive. It has a peculiar way of curling itself up in a ball round a thin branch.

Dipsas ceylonensis.—Several specimens of this snake have been sent to me from the hills both in North and South Travancore.

Dipsas forstennii.—A single specimen taken by Mr. Marshall near Ponmudi.

Dipsas dightoni.—This snake was described and named by Mr. Boulenger in a recent number of this Society's Journal. Three specimens have been taken on Pirmard. The type is in the British Museum.

Dryophis dispar.—Three specimens have been sent to me from the High Range.

Dryophis mycterizans.—A very common snake and the only one that the ordinary native is not afraid to handle. Boys often bring them in, having first taken the precaution to tie up the head in a bundle of rags. It does not thrive in captivity though it feeds well. One female brought to the Public Gardens on July 30th, 1891, gave birth to twelve young ones on September 27th. The young were about seventeen inches long; she did not live for any time. They were produced ovoviviparously.

Much interest has been excited lately over the fate of the python at the Zoological Gardens, London, that was swallowed by its companion.

I do not think that this is so uncommon an event as people imagine among snakes kept together in captivity. Two snakes will often seize the same frog, and when neither gives way one is pretty sure to be swallowed. We have had several instances among the snakes in the Public Gardens and have had to extricate them from their perilous position. On one occasion more than half the length of one of these snakes had disappeared down the throat of one of his companions, but it was pulled back by the head keeper none the worse for its engulfment.

Chrysopelea ornata.—A few specimens of this snake have been sent to me from the hills, and I have taken it about Trevandrum.

Cerberus rhyncops.—A single specimen was brought in by a fisherman. It was peculiar in having the scales in 27 rows, two more than usual.

SERIES C.—PROTEROGLYPHA.

Callophis nigrescens.—This is not a common snake and is only found at considerable elevations. I have received it only from the hills of North Travancore. All the specimens are under two feet long and are constant in coloration, namely, pale reddish-brown with five black longitudinal bands. I have never heard of any one being bitten by this snake.

Bungarus caeruleus.—I have taken several specimens in Trevandrum and have had several sent from the hills. The natives dread this snake very much. It will feed on other snakes readily, and on one occasion before I knew of this propensity, I put one in with it and in the morning it had disappeared. One was killed in the Public Gardens with the tail of a rat-snake, of almost its own size, hanging out of its mouth.

Naia tripudians.—Common in the hills and plains. Mr. Ingleby writes : "The cobra may be kept with fair success when once it adapts itself to feeding. The longest period which a cobra has been kept here is ten months, and the snake is still alive, and eats large bull frogs with avidity. They are naturally very fierce, and when put together often strike each other but without showing the slightest effect. Cobras, as also rat-snakes, commence to swallow their prey as soon as seized."

On one occasion two snake-charmers created a good deal of excitement in Trevandrum by producing cobras out of the mud walls of

every compound they went to. At last they went to the Police Office, where they soon captured a couple which were promptly impounded by the inspector, much against the wishes of the charmers, and were at once sent to me. I examined them and found that the fangs had been removed, thus showing that the charmers had by sleight of hand introduced the snakes, which they pretended were wild. Needless to say the men disappeared, in order probably to renew their stock-in-trade. One of the cobras I kept alive, the other I killed and displayed in the Museum with its mouth open, and a legend detailing how it came into my possession, as a warning to the credulous.

These snakes appear to prefer the larger kinds of frogs, especially large specimens of *Rana tigrina*. In captivity they take these with avidity, but are not attracted by the smaller kinds. They are capable of swallowing very large creatures proportionately to their own size. One was brought in that was about four feet long. At one part of its body it measured eight inches in circumference, the skin was much stretched and the scales widely separated. On cutting it open a water lizard (*Varanus bengalensis*), two feet long, was taken out whole.

Naja bungarus.—This is not a common snake, but may be met with at various elevations in the forest. I have it recorded from Ponmudi, Pirmerd, and from the foot of the hills. The largest specimen we have is eleven and a half feet long. The young ones are conspicuously banded. I have never heard of any one being attacked by this snake. On one occasion I rode over one which came suddenly out of the jungle and passed between my pony's legs.

Enhydris curtus.—Of the sea snakes little can be said; they are brought in from time to time by the fishermen. Of this particular species we have three specimens.

Hydrus platurus.—Three specimens.

Hydrophis torquatus.—A single specimen.

Enhydrina valakadien.—Three specimens.

Distira ornata.—Two specimens.

Distira stokesi.—One specimen.

Family VIPERIDÆ.

Vipera russellii.—This is a common snake in the low country and very dangerous on account of its sluggish habits. It is fairly common

on the hills also. In confinement it does not appear to thrive. If disturbed, it swells its body and emits a very loud hissing. I have known several cases of dogs attracted by the sound attacking the snake and falling victims to their temerity.

Ancistrodon hypnale.—Not common and only found on the hills. Mr. A. F. Sanderson, who was bitten by one of these snakes in 1876, has given me the following account of the circumstance :—

“I had just gone to bed and was half asleep when, in turning over, I put my foot down on the blanket, which was folded up at the foot of the bed, and felt a prick on my little toe. I thought it might have been a pin, or thorn, and did not rise at once, but as it began to pain I got a light and found a small snake coiled upon the floor just below where the blanket had been ; so I got a stick and ‘jobbed’ him. Then I tied a handkerchief tight round my leg above the knee and drank as much strong brandy and water as I could. The pain continued all night so that I got no sleep, and the leg up to the knee was very much swollen and continued so for two or three days, during which time I could not put my foot to the ground. I forgot to say that, as soon as I knew it was a snake-bite, I made two cuts, crossing each other, on the wound and dropped a little carbolic acid into it. I sent the snake to Frank Bourdillon who sent it home and afterwards told me its name.”

Mr. Bourdillon when he left Travancore gave me his copy of “Theobald’s Reptiles of India,” in which he has noted marginally that it was this snake that bit Mr. Sanderson in September, 1876.

Trimeresurus anamallensis.—A common snake on the hills, variable in colour changing with the seasons, being quite light in the dry season and with faint markings, while in the wet it is dark and the markings are clearly defined.

Baron J. Von Rosenberg was once bitten by one of these snakes on the High Range. He has given me the following account :—

“I did not notice that I had been bitten. The men walking behind me said, ‘Hulloa ! that snake nearly bit you.’ I had shoes on at the time. I walked on ten miles and then sat out for an hour looking out for bison. I had felt no pain so far. On getting up I found I could not stand, and my foot swelled up so rapidly that I had to slice off the shoe. It was half as big as my head when I got back to

the bungalow by the help of three coolies. The marks of the fangs were distinct. I was in pain and feverish all night, and next morning a large cupfull of blood and matter came away. After two days I could put my foot to the ground, but it was several days before I could wear anything but a slipper. About a year after, the same place swelled up and there was pain and discharge for a few days. I saw the snake as it went away, a small green one. The marks of the fangs became very distinct as the swelling stretched the skin."

I met a hill man myself on one occasion, having the lower part of the right arm withered and useless, and he told me it was the result of a bite from this snake. As a rule this snake is only found at considerable elevations. But one was taken alive at the foot of the hills and lived in Trevandrum for some time.

Trimeresurus macrolepis.—Not uncommon on the hills from about two thousand feet elevation.

Since this paper was read before the Society, I have had another instance of one snake swallowing another brought to my notice but the affair ended unusually.

Mr. Ingleby writes: "Some frogs had been put in the glass case containing two rat-snakes, and while I was selecting from the rest, one of the snakes seized a fair-sized frog and apparently the other one must have got hold about the same time. A visitor shouted to me that one snake was swallowing the other, and just as I got to the cage the head of the one was just disappearing down the throat of the other. In about ten minutes' time, and with some difficulty, about one-third had disappeared, and then the snake rested, after a while he commenced again, and more than half had gone when a tremendous struggle took place; the snake inside appeared to twist himself round inside the other one; any way after a time the swallowing snake began to disgorge, first one or two inches, then he would stop and take it all in again, but finally the other got his tail around the water pot in the case and got some beverage, and before long out he came, frog and all, both alive."

NOTES ON THE TSAING OR BANTING, *BOS SONDAICUS*.

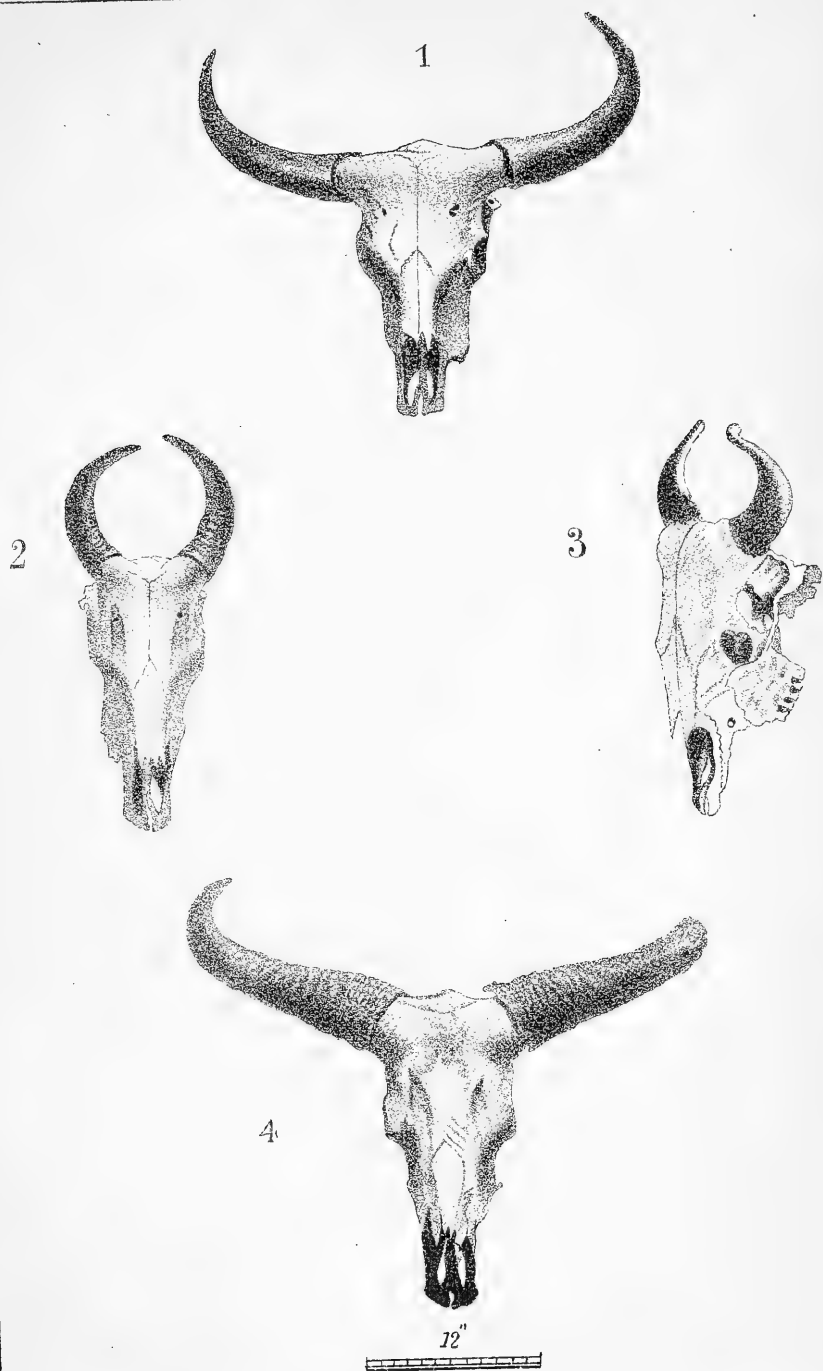
BY VETERINARY-CAPTAIN G. H. EVANS.

(With a Plate.)

(Read before the Bombay Natural History Society on 19th Sept. 1895.)

These creatures may be found in most parts of this province (Burma) where suitable cover and grazing exist. They collect in small herds of from eight to a dozen individuals, occasionally, however, as many as twenty may be seen together, and I have no doubt that under certain circumstances this number may be exceeded. Each herd is governed by a bull, but it is by no means rare to find two or three in a herd ; these are, however, younger animals. As bulls advance in years they are frequently turned out by younger and stronger rivals, and are thus forced to lead solitary lives. In their habits tsaing are very shy and retiring, and bound off immediately on the approach of man. As a rule they avoid the vicinity of villages, and, as far as I am aware, do not enter open cultivation, but I have several times found fresh tracks near jungle hamlets, and have known them to do considerable damage in the Toungyas (clearings in the forest for cultivation). Their food consists principally of grass, bamboo leaves and shoots ; the latter are much relished by them, as also is a largish fruit* about the size of an apple which, when ripe, drops from the trees in quantities. They feed from early morning till nine or ten o'clock, but sometimes in cloudy weather and in the rains to a much later hour, after which they retire to lie up in the shade. These creatures wander about a great deal visiting different grounds at certain seasons of the year, their migrations being greatly influenced by the pasturage. During the early rains they are attracted to the bamboó jungle by the young shoots. At this time also they are frequently driven into the open by the flies which are then intolerable, whilst during the hot weather the shade of the heavy jungle and cane brakes is sought. Generally speaking, tsaing prefer the lighter kinds of forest, such as Eng tree forest, where the principal species is the *Dipterocarpus tuberculatis* and the cover is light. I have not

* The fruit or rather fruits referred to are the ban-bwe-thi, fruit of the *Careya arborea*, and the zyn or zym-byun-thi, fruit of the *Dillenia pentagyna*.



From Photographs.

A. P. Cortez & Co. Lithos. Bombay.

Skulls and Horns of the Tsaing (Bos sondaicus)

seen them at great elevations, though they appear to like the lower slopes of the hills.

Other game may be met with when stalking tsaing; these are sambar, bear, &c., and at certain times elephants and gaur. I think the only time for good stalking is from the end of May till the end of November. During this period the ground is very soft, the leaves do not crackle, and the twigs when trodden on do not, in their soddened state, snap with the usual pistol-like report. After the first few showers is a very good time, as it is not then difficult to stalk in cotton or rubber-soled boots. Most of the animals at this season keep out a good deal in the glades, for the heat in the muggy and overpoweringly still atmosphere of the jungle, the smell of decomposing leaves, combined with the horse and elephant flies, mosquitoes, and other insect abominations, are too dreadful. The months of June and July are excellent for stalking; the undergrowth is not very high, the ground is better for tracking, sky cloudy, and atmosphere cooler; the only discomfort is the incessant rain; provided however, one has a watertight Té (little shed), a good dinner and a sandfly-mosquito-proof net in readiness on return to camp, the discomfort is soon forgotten. October and November are also good months. The cover is of course thick, but the ground is still in fair condition, and there is then no rain. Though fever is always more or less prevalent, it is especially so at this time.

A start should be made at daybreak and all likely places inspected. Fresh tracks should be sought for in places, such as banks of streams, salt-licks, favourite glades, &c.; and, if the tracks of a solitary bull be found, it is as well to follow them up quickly, though quietly, as these animals frequently graze in circles; moreover, the chances are in favour of catching up such a bull before he settles down for the day.

Signs will not, as a rule, be wanting to let you know when he is near at hand. If a shot be obtained, the bullet should be placed well forward and moderately low. If, as constantly does happen, the animal dashes off wounded, and the ground be fairly open, by running up, another shot may be gained. Should he take to heavy cover, sit down and smoke a pipe; this will give him time to bleed and die, or at least to cool down. Trackers in this part of the world are prone to be very rash, either from confidence in their escape by their

monkey-like activity, or from ignorance (this remark applies only to tsaing and elephants, it is quite the other way on with bison and rhino, of which creatures, even when unwounded, Burmans have a holy dread). Following up tracks immediately after wounding an animal is a proceeding calculated to provoke a charge. The safest plan is to take your heaviest weapon in hand, post a man on a tree commanding a good view of the cover, while you and the tracker circle round the patch and see if the animal has passed through; if this is not the case, and the man up the tree can afford no information work quietly through, taking advantage of trees, telling the look-out to keep on the *qui vive*. The Karens say that, if charged, the best thing is to lie down; these people I know put this plan into practice. Stalking herds is generally very disappointing as the ever-watchful cows are always on the alert, added to which, if lucky enough to get into a herd, it is very long odds against getting a shot at the bull, as nine times out of ten fortune favours him. When startled, herds dash off, but, unless they have been much disturbed, soon settle down. I do not think that tsaing are more inclined to charge than bison, or that solitary beasts are worse in this respect than herd bulls. Occasionally, as is the case with most heavy game, a tough individual may be met with who is prepared to see the fight out to the bitter end. I have heard of only a few cases in which a bull has charged unprovoked, and then he appears always to have been taken by surprise. I have known wounded animals to give much trouble. The tsaing is then a nasty beast, being more active and persevering than a bison, returning again and again to the attack. The weapons I have found most effective are a smooth double eight-bore, charge eight to ten drams, weighing twelve pounds, built for me by Adams and Co., and a double B 577 express by the same maker; however, I should always prefer the former weapon if it came to a scrimmage.

Voice.—I have only heard these animals utter two cries—one a loud bellow, probably a call, and the other the familiar snort made by bison and these creatures when frightened and about to make off. The flesh, when kept for a short time, is not at all bad eating, the tongue, tail, and marrow bones are especially good. Sometimes the flesh is strongly flavoured. The Burmese are very partial to it.

The tracks of tsaing are very similar to those made by the gaur.

Tsaing are not domesticated in Burma. A few instances in

which calves have been captured and brought up are well known. A man named Moun^g Bya Gale of Paya-Thonzu in the Pegu district has owned three tsaing at different times ; they were all quiet animals, and I am informed that two years ago he drove a pair to Pegu when attending the pagoda festival. Very many of the domestic cattle of the country resemble tsaing in several points, *viz.*, in colour, white patches on the buttocks, and in the possession of the white stockings. I am of opinion that the infusion of some tsaing blood into the cattle of the country would do much good.

DESCRIPTION.

Tsaing are massive animals with good girth. The dorsal ridge is well developed, extending to about the centre of the back where it ends somewhat abruptly ; from this point a darkish line runs to the tail most noticeable in cows and calves. Dewlap decided and moderate in size. Legs are fairly long, hoofs small, neatly shaped, and black in colour. In general appearance they resemble the gaur, but are longer-legged and altogether less bulky.

Colour.—That of old bulls is dark chestnut, which in certain lights makes them appear darker than they really are. I, however, have never seen any bull as dark as a solitary bull bison. Under the abdomen and in the region of the axil and groin the colour fades off to brown. The forearms are darkish grey, and the legs from a little above the knees and hocks down to the feet are of a dirty white or yellow colour. This is the case with both sexes, as also is a roundish or oval white patch on the buttocks which extends upwards as far as, but does not surround, the root of the tail, and then tends downwards to the inside of the limbs. The tail extends to just below the hocks ; the extremity is provided with a good tuft of hair. Face dirty grey ; edges of lips, also inside of ears, whitish. Ears are of moderate size. The eyes are full and bright, the pupils being blue in colour. Muzzle is black.

Young bulls are brighter in colour, and the various markings are less prominent than in aged animals.

Cows are a bright chestnut or reddish-brown colour which is permanent ; calves are the same. The faces are a trifle paler, especially

noticeable round the eyes, forehead, and about the muzzle where it is dirty white. Under the abdomen and down the inside of the legs the colour is also dirty white.

Heads.—Compared with those of the gaur, they are comparatively longer and decidedly narrower and are altogether lighter, and the ridge between the horn cores is but slightly developed, as also is the convexity at the vertex. The concavity of the forehead, which is such a prominent feature in the skull of the gaur, is almost wanting in these animals. As in the case of gaur the solitary bulls appear to carry the best heads. The horns are flattened at the base, the anterior faces being often very rugged. The direction usually taken is outwards; and upwards towards the tips they take an inward or backward curve. In young bulls and cows the horns are cylindrical; in the latter they are generally directed upwards, inwards and backwards, and are often lyrate.

	Solitary Bull.	Solitary Bull.	Herd Bull.	Herd Bull.	Cow.	Cow.
Length of right horn ...	23	23½	22½	21	12½	12¼ inches
Girth „ ...	15	12½	11	10½	8	8½ „
Length of left horn ...	15½	28½	22½	22	12¼	12 „
Girth ...	15	12½	11	10½	7½	8½ „
Widest span ...	34	34½	30½	29	11	12½ „
Breadth between horns	9	11	9½	9½	9	5½ „
„ „ eyes ...	7½	9½	8½	8	7	8 „
Length of face ...	21	22	22½	21	19	20½ „

Measurements of a bull and cow.

	Bull.	Cow.
Length of face ...	21	20½ inches
Between horn cores ...	11	5½ „
Girth base of neck ...	46	44 „
Length poll to dock-over curves ...	85	76 „
Length of tail ...	36	34 „
Girth of chest behind elbows...	83	74 „
Girth of abdomen ...	38	35½ „
Girth of forearm ...	21	18½ „
Girth under knee ...	7½	7 „
Height ...	64½	61 „

These measurements were taken with the utmost care, a tape measure being employed. Owing, however, to the positions in which these animals often fall when shot, they may be fractions of an inch out.

The accompanying sketches are from photographs supplied to me by Mr. J. D. Rees and Mr. A. G. Trapmann.

FURTHER NOTES ON MAN-EATING TIGERS.

BY REGINALD GILBERT.

(Read before the Bombay Natural History Society on 19th Sept., 1895.)

On the 4th September, 1889, I last addressed the Society on the above subject. This paper is printed at page 195 of Volume IV of the Society's Journal, and I attempted to show that the general impression prevailing about man-eaters as to their being old, mangy, lame, &c., and unable to kill game was a myth, and I advanced a theory that man-eaters inherit this vice from their parents or are taught it by their parents or companions, so that the practice never dies out amongst the tigers of the particular district inhabited by man-eaters. Since 1889, with the exception of the case I am now about to describe, I have no further reliable information to give about man-eaters. At the end of last year I was informed by my friend Mr. C. W. Hudson, C.S., Assistant Collector of Thana, that a man-eating tiger had appeared in the Thana District, and that some of the contractors, who had taken contracts to cut down Government jungles, were unable to get their men to work in the jungles owing to the fear inspired by this tiger, who was alleged to have killed many victims. However the number of its victims was, as usual in these cases, greatly exaggerated, as subsequent careful inquiries in the district showed that only five victims were killed by this man-eater during its short career. Mr. Hudson promised to invite me to join him in beating for this tiger, or rather tigress, as soon as he could spare the time and get reliable *kubber*. In January, 1895, I received an invitation from Mr. Hudson to join him for a few days' shikar after this beast, in the Thana jungles, towards the Western Ghats. I was told that her line of country was not an extensive one and that, with a large number of beaters, we should probably be able to get her. I regret to say that I was unable to join Mr. Hudson, but he, in company with Mr. Hodgson of the Forest service and Mr. Clements, I.C.S., was successful in bagging her on the 23rd January, 1895, together with her three cubs. She was not a full-grown tigress and only measured 7 ft. 11 in. However, before I proceed to this part of the story, I had better give a history of the animal, her victims, the locality, &c. The information I have gained about her has been very carefully collected from patels and village and police officials of the Dis-

tricts obtained through the District officers and may, I think, be looked upon as fairly accurate.

The Thana District and even the Island of Salsette, some 15 or 30 years ago, were constantly over-run with man-eating tigers. My friend, Mr. W. B. Mulock of the Bombay Civil Service, now known as Mr. Homan Mulock, in his native Emerald Island, has killed several man-eaters in the Thana Districts, and even in Salsette not far from the Marole Caves. The last man-eater, previous to the one Mr. Hudson killed, was killed by Mr. Mulock in Thana not very far from the place where Mr. Hudson killed his. Speaking from memory, I believe it was killed about the year 1880, probably many of our members will recollect it, because Mr. Mulock wrote an account of it in the local papers, describing how a tigress went into a village near his camp, dragged out a man and carried him off to the jungle. Mr. Mulock was sent for and followed up with the villagers, until he found the victim with one leg eaten off. Mr. Mulock remained over the corpse alone, and sent the men to collect beaters. Whilst they were gone the tigress came back, and Mr. Mulock shot her and took the man's leg out of her. I was shooting in these districts last May, and had with me a patel who was with Mr. Mulock at the time, and who graphically described to me the whole adventure. I mention this for the purpose of further proving my theory that man-eaters are found in particular districts only. In support of this theory, a man-eater has never been heard of in the extensive jungles of North Kanara in the past twenty-five years, and here I might state that I am informed by a gentleman, who is well acquainted with Kanara, that in the extensive jungles of North Kanara, where tigers are plentiful, a man-eater has never been heard of in the last twenty-five years. Since this man-eater was killed by Mr. Mulock, until the one killed by Mr. Hudson, I have been unable to hear of a single man-eater in the Thana Collectorate. As the tigress killed by Mr. Hudson was not full-grown, it follows that her immediate parents were not man-eaters either, unless they had given up the vice for 15 years, which is unlikely, and it also follows that this tigress was not taught her vice by any companion either. However she *may* have inherited the vice from a grandparent, and this evil character may have remained dormant in her parents, and broken out again in her during her short career.

Now then for particulars. *First victim*, Kania Mahadeo, killed 30th July, 1894. The Patel of his village states this victim was returning from his fields alone and was killed by a tiger on the road. No one saw him killed but a search was made next morning and the corpse was found with tiger pugs all around it. There were four large teeth-marks on the left side of the corpse. The chest was clawed and the nape of the neck scratched. The body was *not* eaten. The pugs were supposed to be (or judged to be) those of a small tiger,—“patâit biblâ.” *Second victim*, Rama Balu, killed on 24th August, 1894, five miles from where the 1st victim was killed. The patel of his village states that Rama went into the forest to graze cattle. When evening came he did not return and next day a search was made. His corpse was found with tiger’s pugs all around it. The right ear was torn and claw-mark in the region of this ear and also below the left ear; the neck badly bitten and the left upper-arm clawed. The pugs were judged to be those of a small tiger,—“patâit biblâ.” It will be observed that neither the 1st nor the second victim was eaten—not so the *third victim*, Kanni, widow of Nathu Bendia, killed on 21st September, 1894, at a place 17 miles from where the second victim was killed. This victim went into the forest for some roots, &c., accompanied by a companion. She saw the tiger and fled but the tiger ran after her and caught her. My informant says it was a large tiger,—“mothâ patâit asava.” The legs of the victim were eaten up to the waist and the right arm and the fingers of the left hand were also eaten. The neck was twisted, throat torn open and claw-marks on back.

Fourth victim, Ambi, wife of Dhau, killed 24th November, 1894, eight miles from the place where the second victim was killed. The patel of the village states that this victim went to the forest to cut grass, and that whilst cutting grass, a tiger came out of the forest, caught her by the neck, the tiger’s teeth meeting in front, and took her into the forest and ate her two legs below the knee. Her husband, who was also cutting grass with others somewhere near, came up and saw the tiger on the victim. They all shouted and the tiger bolted, leaving the corpse. These people say they saw the tiger eating the victim, and it was a striped tiger,—“patâit vâg.”

Fifth victim, Changu Jagu, killed 26th November, 1894, near the place where the second victim was killed. The patel of the village says that Changu went into the jungle for grass at midday and did not return by

evening. The brother came and told the patel in the evening. Next morning a search was made and the corpse found partly eaten, with the pugs of a tiger all round it. A portion below the waist was eaten, claw-marks on left shoulder; neck bitten and throat torn open. The tiger was said to be probably a striped tiger,—“*Patâit vâg.*” It was on a hill near this that the tigress herself was eventually slain. Mr. Hudson tells me that the jungle inhabited by the tigress was a large mixed jungle, evergreen in places and in some parts open with teak trees and long grass and “*karvi*”—an ideal tiger country—with immense blocks of “*coupes*” exploited ten years ago and strictly conserved since and containing long ranges of rocky hills, rising in places to the height of 1,800 feet, with steep sides of sheer rock and water everywhere. The population is sparse. On the 23rd January, 1895, Mr. Hudson, together with Mr. Hodgson and Mr. Clements, organised a very extensive beat with 300 beaters. They had a fourth gun in Mr. Illava, Abkari Inspector.

The tigress had killed a cow at midday and the beat took in a large hill. Mr. Hudson was posted just below the ridge of the hill and Mr. Hodgson and Mr. Clements were posted a mile from Mr. Hudson down below him, whilst the fourth gun commanded the top of the ridge and the other side of it. Shortly after the beat began the tigress gave three or four low deep short grunts in the long distance, probably calling to her cubs, and again an hour afterwards when she was much nearer the guns. She followed the ridge till she came to within 60 yards of the fourth gun, when she turned down to avoid an open space, grunting to her cubs as she did so. She was preceded by two cubs but the third was behind and made her anxious. She was now almost broadside on to Mr. Hudson, crossing in front and a little above him. As she turned her head to encourage the lagging cub, Mr. Hudson fired and dropped her with a bullet at the point of the shoulder, but as she still dragged herself on Mr. Hudson fired again. She recovered herself and dragged herself away and it took a few more bullets to settle her completely. The cubs gave no trouble; the shouts of the beaters behind them soon drove them out. Efforts were made to catch one of them alive but it was a little too big for that. The tigress measured 7 ft. 11 in. and was not full-grown. Two of the cubs measured 3 ft. 9 in. and one 3 ft. 10 in. Two were females and one a male.

I think there can be no question that this tigress was the man-eater. She was killed in the immediate neighbourhood of the place where she had slain her human victims and she was admitted by the inhabitants to be the culprit. The weight of this evidence tends to show that the pugs around the corpses of her victims were those of a small tiger. Since this, there have been no further human beings killed by tigers in the Thana District. It is true, three other tigers have been killed in the Thana District since, one by a native near Bhiwandi in April, and two others in May by Mr. G. P. Millett and myself, but I think there can be no question that none of these were the culprits. As I fear there is scarcely a tiger left now in the Thana Districts, I shall not be able to investigate further in this particular district, my theory as to man-eaters inheriting the vice, and never entirely disappearing from a particular district. Perhaps, therefore, the last man-eater has disappeared from Thana for ever. I should add I have seen the skin, which is not mangy.

The question remains why should this youthful tigress have taken to man-killing. As her first victim was killed in July, 1894, and her cubs were 3 ft. 9 ins. in January, 1895, I take it that she commenced killing about the time her cubs were born or soon after or perhaps even soon before. I am not able to say for certain, but I believe there were probably cattle grazing about in these jungles and lots of wild pig, so that hunger cannot have been the cause. She was not lame nor unable from any bodily defect to kill cattle and game. Her first two victims were not even eaten, although she appears to have had a full opportunity to eat without disturbance, as the corpses were not sought for or found till the next day. *Query*.—Could she have killed these out of anger at being disturbed with her cubs? Her third, fourth and last victims were all partially eaten, and in two cases it may be noted that the legs of the victims were eaten. Her parents or companions could not have taught her this vice, because, as I have before stated, no man-eaters have been heard of in these districts since 1880. She must then have inherited this vice from some distant ancestor.

I have nothing further to add which may throw light on the subject.

THE POISONOUS PLANTS OF BOMBAY.

BY SURGEON-MAJOR K. R. KIRTIKAR, I.M.S., F.L.S..

CIVIL SURGEON, THANA.

PART XIII.

(With plate O.)

(Continued from Vol. IX, page 365.)

(Read before the Bombay Natural History Society on 19th Sept., 1895.)

ANACARDIUM OCCIDENTALE—(Linn.).

Natural Order—ANACARDIACEÆ.

MARATHI—काजू (Kāju).

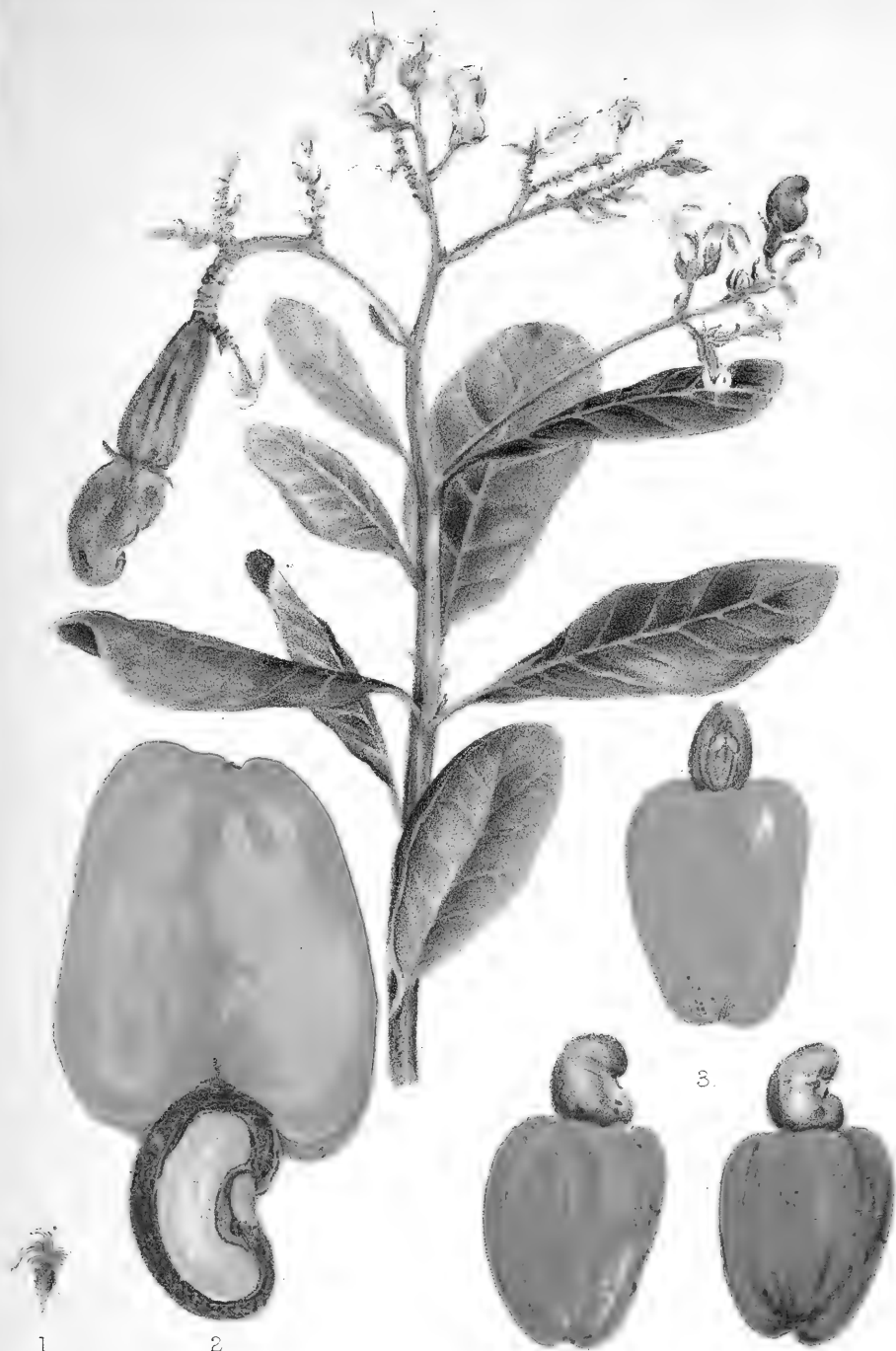
This is the *Cashew-nut* tree of English writers. It is quite an ornamental tree when in full blossom and fruit, displaying the most gorgeous colours in various shades. It is an evergreen, throwing out fresh foliage every year. From all the evidence I can gather, it is a tropical American and West-Indian plant naturalized in the Eastern tropical regions. In India, and especially in Western India, it is largely met with along the sea-coast and its adjacent sandy tracts, and in the rich *moorum* soil inland. It thrives very well in the Thana district.

It varies in height from ten to twenty feet. The tree blossoms once a year regularly, in the cold weather, even as early as November. The flowering often lasts till April and even later. The seed is ripe in May and June; not unfrequently as early as February.

Generally speaking, it is something short of a tree, and something more than a mere shrub.

TRUNK.—Short, thick, and regular up to three or four feet above the ground. Beyond that, it is crooked, and very irregular in branching. The branches, however, taken altogether, make it a very graceful plant, quite fit to be introduced into any garden in India which would like to display splendid colours in foliage, flower, and fruit. The crooked branching is no bar to its garden-beauty.

BARK.—Considerably rough. In old trees, says Sir William O'Shaughnessy, "it is deeply cracked." The juice from the stem is



Isaac Benjamin del.

Mintern Bros. Chromo Lith. London.

THE POISONOUS PLANTS OF BOMBAY.
Anacardium occidentale. Nat. Ord. Anacardiaceæ.

($\frac{1}{2}$ natural size)

1. Flower nat. size.

2. Section of Fruit, nat. size.

3. Fruit. $\frac{1}{2}$ nat. size.

not milky, but thickish and resinous, of a slightly brownish tinge, blackening on exposure. "From the bark," says Baillon,* "oozes a yellowish hard resin, having almost the appearance of yellow amber, the Cashew-gum (Fr. *Gomme d'Anacarde*) soluble, and used for nearly the same purposes as gum-arabic." This shows that the resinous exudation from the bark does not possess any irritant properties. I may observe, however, that in the plants I have examined in the Thana district, I have not been able to notice any such yellow amber-coloured resinous exudations on the bark. There is a gummy exudation from the bark, but it is not resinous. Of this more hereafter. The bark contains much tannin. It is used to *curry* leather, and to prepare astringent lotions and gargles.

WOOD.—Dark brown; inferior in quality, as it is not generally deemed of any value in carpentry; † but Major Beddome says it is used for packing-cases; and Captain Dance says, it is, in Tavoy, a *large tree* used in boat-building, and it forms a charcoal which the iron-smiths there consider the best for their trade.

LEAVES.—Simple, smooth, alternate, exstipulate, petioled, quite entire, ovate or obovate; with a slightly rounded emarginate apex; smooth on both sides and of a hard texture; "Narrower but obtuse at the base." (Wight and Arnott.) § The length of the leaves is from four to eight inches; the breadth from three to five inches.

The *Venation* of the leaves is generally well-marked, whitish and prominent on the under-surface. The *nerves* generally in ten pairs, often less; nearly horizontal; sometimes bifurcating faintly. The leaves, like the bark, contain much tannin.

PETIOLE.—Varying in length from a quarter to half an inch; slightly grooved on its ventral aspect; at times almost cylindrical.

INFLORESCENCE.—In panicles which are bracteate, copious and situated at the apex of old branches bearing both male (*i.e.*, barren) and hermaphrodite flowers scattered without any special order on the pedicels. Note that the hermaphrodite flowers appear and develop into fruit, long before the new foliage of the year is thrown out. Sir William O'Shaughnessy observes that "There may be trees which

* Natural History of Plants, vol. v, page 303.

† Balfour's Timber Trees of India, page 16; 1870.

§ Prodrum Flor. Ind., vol. i., page 168.

produce barren flowers only.” I am not quite sure of this, so far as my observation goes with regard to plants growing in the Thana district. I am quite aware of the fact, however, that some of the branches of the panicles may have both barren and hermaphrodite flowers, and yet bear no fruit, although their richest blossom may apparently hold forth the hope of a mature fruit and seed.

PANICLES.—“Corymbose, branched and spreading” (Wight and Arnott)*; six to ten inches long; pubescent. The branches of the panicles are long and naked to the tips when the flowers are collected (Hooker).

BRACTS.—Leafy, numerous, lanceolate, hoary. Hooker† says that they are “*gibbous*.” This does not appear to be the case on this side of India. (K.R.K.)

BRACTEOLAS.—Present at the base of pedicels; “broadly ovate,” say Wight and Arnott (*op. cit.*), generally lanceolate; acuminate.

FLOWERS.—Small; pentamerous; polygamous, *i.e.*, a flower-stalk may bear both male or barren, and hermaphrodite flowers. The diameter of the flowers is generally about $\frac{1}{3}$ inch. Their colour is pale yellow with pink longitudinal stripes, often of a deep crimson colour on this side of India.

The odour of the flowers is strikingly penetrating even from a distance, and partakes of the characteristic mixed odour of cloves and cinnamon. There is no tree or shrub on this side of India which is so easily recognizable from its mere odour as this plant. Given this odour, there is sure to be a Cashew-nut plant in flower close by. Such has been my experience each time I have been in the close vicinity of a Cashew-nut plant in flower. The odour is quite unmistakable. Some say the odour is disagreeable, but opinions differ.

ÆSTIVATION.—Of Calyx and Corolla, imbricate.

CALYX.—Inferior, cleft nearly to the base.

Sepals—Erect; deciduous; “Oblong, conic, acute and pretty smooth” (Sir William O’Shaughnessy). § The base of sepals accrescent, forming an erect disk.

* Prodrum Flor. Ind., vol. i., page 168.

† Flora of British India, vol. ii, page 8.

§ Bengal Dispensary, page 280, edition 1841.

COROLLA.—Alternate with the sepals, free, entire, acutely recurved.

Petals.—Acuminated, linear-lanceolate, twice as long as the sepals; often longer.

Note that the sepals and petals remain unchanged after flowering (Kurz). *

STAMENS.—Usually nine; all fertile. One of these is nearly twice as long as the rest; the length of the remaining stamens, however, is by no means uniform; some are smaller than others, often alternately so. Baillon notes (*op. cit.*) that “They are all verticillate, 2-seriate.”

FILAMENTS.—Connate at the base, free upwards; adnate to the disk, “Which is prolonged upwards,” says Baillon, “in the shape of a glandular ring.” It is on this disk that the petals are situated. †

ANTHERS.—2-celled; introrse; longitudinally 2-rimose; basifixed. The anther of the longest filament is twice as large as that of the minor ones. It is of a bright crimson colour. The anthers of the minor filaments vary in colour from orange-yellow to crimson on this side of India.

PISTIL.—In the male flowers minute, with a very short style. In the hermaphrodite flowers distinct and well-developed.

OVARY.—In the hermaphrodite flower free; campylotropous; superior; § one-celled; obovoid or obcordate. Baillon describes it as “compresso-obovate, or obcordate,” hence gibbous. This is a more accurate description I think.

STYLE.—Simple or solitary, corresponding to the one-celled nature of the ovary; filiform; excentric; becoming convolute, as if to bring the simple stigma in contact with the large anther of the long filament (Roxburgh).

STIGMA.—Minute; often tinged crimson.

OVULE.—Solitary, long, conical; inserted at the summit of a suberect ascending funicle. The funicle is thus lateral. The ovule, says Baillon (*op. cit.*), is the same as that of its congener *Mango*, at

* Forest Flora of British Burma, vol. i, page 302.

† Wight and Arnott's *Prodromus Floræ Indicæ*, vol. i, page 168.

§ Hooker puts a query against this, it is not known why. (*Vide* Flora British India, vol. ii, page 8)—K. R. K.

the base, though finally the funicle supporting it is inserted a little higher.

CHALAZA.—Superior.

MICROPYLE.—Introrse, inferior near funicle.

FRUIT.—An ash-coloured nut, and as such dry and indehiscent ; kidney-shaped ; usually about an inch long, sometimes a little bit longer ; a quarter of an inch broad at the hilum when fully developed ; somewhat compressed ; marked at the hilum with umbilicus, and the cicatrix of the style. Mesocarp soft, corky, lacunose and oleo-resinous. The epicarp, or pericarp, as Sir William O'Shaughnessy describes it, is "coriaceous," and smooth (K. R. K.) ; and not "woody" as Baillon says.

The fruit is termed "Nucumentaceous" by Baillon. It is seated on a succulent obovoid accrescent receptacle formed from the enlarged disk and top of the peduncle of the fecundated hermaphrodite flower. It is wrongly called pyriform. It is anything but pyriform, in my humble opinion. So far as I know, it is more obovoid than pyriform. This obovoid receptacle develops to the length of from 2 to 4 inches, being sometimes two inches at its broadest part. The peduncle is narrow, cylindrical, and rather hard before the fecundation of the flower ; after fecundation it thickens, becomes succulent, and assumes an obovoid form. This thickened fleshy peduncle is ordinarily known as the Kâju fruit, though the real fruit, botanically speaking, is the kidney-shaped body of the termination of the fleshy peduncle. This fleshy peduncle is not unoften of an irregularly oval form. O'Shaughnessy in his Bengal Dispensatory says it is "oval."

SEED.—Kidney-shaped, ascending, corresponding to the shape of the pericarp.

TESTA.—Membranous but crisp, and easily removable ; of mottled reddish-brown colour outside, and deep crimson inside. It is of an astringent aromatic taste. Observe that Hooker says that the "testa is adherent," but it is not so in reality. It is separable by a "resinous fracture" with the merest touch or crush between the fingers, exposing to view the cream-white or milk-white cotyledons. The testa under such circumstances cannot be in any way said to be "adherent."

COTYLEDONS.—Glossy white ; sometimes cream-coloured ; thick, softly fleshy, with a plano-convex exterior, and a deeply grooved interior ; distinctly kidney-shaped, answering the shape of the pericarp generally.

RADICLE.—Short ; exserted ; hooked, or “incurved and inferior,” as Baillon describes it. I think Wight and Arnott describe it more accurately when they say it is curved upwards from the base of the cotyledons.

ALBUMEN.—None.

EMBRYO.—Having the form of the seed ; erect, milky-white ; *Plumule* minute, milky-white.

REMARKS.

The following are the synonyms of the plant :—

1. *Acajuba occidentalis* (Gaertner De Fructibus, vol. i, pp. 192-193).
2. *Cassuvium pomiferum* Lam (Rheede Mal. iii, t. 54.) (*Rumphius Amb.* i, p. 177 ; t. 69).
3. *Acajou*—South America.

The species known as *Anacardium indicum* and referred to in Johnson's Gardener's Dictionary recently edited by Wight and Dewar (1894), evidently from DeCandolle's “*Prodromus*” * is not different from the *Anacardium occidentale* in any way. Paxton† also mentions a separate Indian species under the same name, viz, *Anacardium Indicum*. From the description given by the elder DeCandolle, there does not seem to be much difference between the true original American species described as *Anacardium occidentale*, and the naturalized oriental plant separately described as *Anacardium Indicum*. This will be fully explained in detail later on. That the two species separately described by the elder DeCandolle are one and the same has been amply proved by the younger DeCandolle, as will be seen from the latest work of the latter, issued in connection with the “*International Scientific Series*” under the auspices of Messrs. Kegan, Paul, Trench & Co., entitled “*Origin of Cultivated Plants*” (1884). In this rich mine of botanic lore, the following are his mature and deliberate opinions

* *Prodromus Syst. Nat. Regni Vegetabili*, Pt. II, p. 62.

† *Botanical Dictionary*, p. 31, 1868, p. 31. New Edition by Samuel Hereman.

regarding the identity of *Anacardium occidentale*, var. *Americanum*, of the Western tropics with *Anacardium occidentale*, var. *Indicum*, of the Eastern tropics. "The most erroneous assertions," says Alphonse DeCandolle, "about the origin of this species were formerly made, and in spite of what I said on the subject in 1855, * find them occasionally reproduced." In proof of this he mentions Tussac, who says † that *Anacardium occidentale* "is an East Indian species," thus aggravating Linnæus' mistake, who believed it to be Asiatic and American. Divorced, as I am in India, from the full literature on this subject, especially continental, including the Journal referred to by A. DeCandolle, in the foot-note quoted below, and marked 1 at page 199 of his "Origin of Cultivated Plants," I am unable to examine the arguments he has used to show that there is no such thing as two distinct varieties, viz., an American and an Indian, of the species *Anacardium occidentale*, as described by his illustrious father Pyrame DeCandolle in his voluminous "Prodromus." I am in a position, however, to unhesitatingly accept the conclusions of Alphonse DeCandolle, the son, in preference to those of Pyrame DeCandolle, the father, as the former are the result of a wider acquaintance with geographical distribution of the Cashew-nut plant.

But before I proceed to quote here fully the grounds on which I accept Alphonse DeCandolle's conclusions, I may note one point with reference to his remark (*vide p. 199 op. cit.*) which runs thus:—"The French name *Pommier d'acajon* (Mahogany apple tree) is as absurd as it is possible to be. It is a tree belonging to the order *Terebintaceæ* or *Anacardiaceæ*, very different from the *Rosaceæ* and *Meliaceæ* to which the apple and the mahogany belong; the edible part is more like a pear than an apple, and, botanically speaking, is not a fruit but a receptacle or support of the fruit which *resembles a large bean*." The italics are mine. The true fruit neither resembles a "bean," nor can it be called a "large bean." From my foregoing remarks, it will have been apparent that I am not disposed to term the fleshy development of the peduncle, called in popular parlance the *Kaji fruit*, "a fruit like an apple." Nor would I, with

* Geog. Bot. Rais, p. 873 from the foot-note of A. DeCandolle in his Origin of Cultivated Plants.—K. R. K.

† Flor. des Antilles, III, p. 55.

equal reason, be disposed to agree with A. DeCandolle in calling it a "fruit like a pear." In shape and botanical structure it is neither like an apple, nor like a pear. But if I were one of those who in former years were disposed to call it an apple, I would with equal vigour and no less reason retort in the very words of Alphonse DeCandolle, that to say that the succulent development of the peduncle "resembles a large bean" is "as absurd as it is possible to be." No tree of the order *Anacardiaceæ* has any pretensions to be called "*bean-like*" any more than "*apple-like*" or "*pear-like*."

But to proceed to the grounds on which A. DeCandolle considers that the *Anacardium occidentale* is an introduced plant in the Eastern tropics, I may at starting say that his statement on this subject is conclusive, and may well be quoted *in extenso*. I shall, however, add my own observations wherever necessary.

"The species *Anacardium occidentale*," says he, "is certainly wild in the forests of tropical America, and indeed occupies a wide area in that region; it is found, for example, in Brazil, Guiana, the Isthmus of Panama, and the West Indies. Dr. Ernest believes it is only indigenous in the basin of the Amazon River, although he had also seen it in Cuba, Panama, Ecuador, and New Granada. His opinion is founded upon the absence of all mention of the plant in Spanish authors of the time of the Conquest—a negative proof which establishes a mere probability."

Whatever the question may be as regards the geographical distribution of the Cashew-nut plant in the Western world, there is no question as to its prevalence in the Eastern tropics, as a mere naturalized exotic. It is certainly not wild in the Konkan, although A. DeCandolle says that both Rheede and Rumphius "indicate" this plant in the south of Asia. According to Rheede (Malabar, iii, pl. 54) the plant is common enough on the Malabar Coast. Rumphius has "different historical and philological proofs,"* "which," says Alphonse DeCandolle, "have convinced me that its origin is not Asiatic." I think I can safely vouch for this statement, for so far as I am able to ascertain, I find no Sanskrit writer of ancient date referring to this plant. Let me add to this the testimony of Rumphius who, as A. DeCandolle says, is always accurate. Rumphius spoke of an

* Rumphius "Herb Amboin." I, pp. 177, 178.

ancient introduction by the Portuguese into the Malay Archipelago from America. The Malay name he gives, *Cadju*, is American ; that used at Amboyna means "*Portugal fruit* ;" that of Macassar was taken from the resemblance of the fruit to that of the *Jambosa*. Rumphius says that the species "was not widely diffused in the islands," in his days. "Garcia ab Orto did not find it in Goa in 1550, but Acosta afterwards saw it in Cochin, and the Portuguese propagated it in India and the Malay Archipelago."*

I have already observed that in describing the species *Anacardium occidentale*, the elder DeCandolle mentions two varieties, namely, (1) *Americanum* ; (2) *Indicum*. With reference to this the young DeCandolle observes that "the existence of the same arborescent species in Asia and America was so little probable that it was at first suspected that there was a difference of species or at least of variety, but this was not confirmed." This will be made clearer by giving below a translation of the description, † originally given in Latin, of the two varieties. It is as follows :—

(a) *The American variety* has a thickened peduncle, about ten times larger than the nut, the longer filament having an abortive anther (*antherâ orbato*), and being slightly dilated at the apex.

(b.) *The Indian variety* has a thickened peduncle scarcely three times longer than the nut, the longer filament being endowed with a thick anther (*antherâ crassâ donato*), other anthers being slightly dwarfed (or ill-developed) (*cæteris subeffæctis*).

It would appear from the above details that the differences are chiefly in the development of the fleshy peduncle in relation to the nut, and in the abortive or thickened condition of the anther-lobe. Judging from the various developmental peculiarities of the anthers in the Indian flowers of this plant, one could hardly consider any chance-arrest of development, or chance-increase in the size of the anther-lobes a sufficient justification for the creation of a new species or even a permanent variety.

Apropos of Alphonse DeCandolle's remarks on the historical aspect of this question, let me here briefly refer to the latest utterances of an erudite Botanist, Dr. Henry Trimen, F. R. S., Director of the

* A. DeCandolle's *Origin of Cultivated Plants*, pp. 199-200.

† *Pyrame DeCandolle, Prodromus Syst. Nat. Regni Veget.*, Pt. II, p. 62.

Royal Botanic Gardens of Peradynia, in his Hand Book to the Ceylon Flora,* issued four years short of a century and a half after Carolus Linnæus—the immortal Father of Universal Botany—gave to the world his *Systema Floræ Zeylanicæ* from Upsala. Linnæus in 1749 spoke of the Cashew-nut plant as “*arbor hodie botanicis notissima.*” If the plant was so in the days of Linnæus, it is no less so in our own day. It has no parallel in the vegetable kingdom. Dr. Trimen observes, with reference to the prevalence of this plant in Ceylon, “that the Cashew-nut is so completely established in the low country, especially in the sandy ground near the sea, as to have all the look of a native tree. * * * * The Sinhalese call it *Caju*, an adoption of the name used by the Portuguese, who no doubt introduced it. The Tamil name for the edible part is ‘*Montirikay.*’† It is figured in Beddome’s *Flora Sylvatica*, t. 163. Its native country is Tropical America, and ‘*Acaju*’ is the Brazilian name.”

“According to Blume and Miquel,” says A. DeCandolle, “the species is only cultivated in Java.” It is known there under the name of *Jamboc monjet*. It is frequently found in the gardens of Java, where, however, it is smaller than in Surinam, as its height in Java does not exceed that of an apple tree in Europe.‡

The Cashew-nut is not unknown in Singapore. Its Malayan name there is *Jambo irong*. Its fruit is said to be coarse, and not eaten there. Its nut is said to be astringent.§ As regards the occurrence of this plant in Burma, from the fact that it is found only “in the beach forests and along sandy sea-shores and dunes of Chittagong and Tenasserim,”|| and also from the fact that it is only a cultivated plant in villages, it would appear that it is an introduced plant.

But to return to Alphonse DeCandolle’s “Origin of Cultivated Plants” once more. He observes that although Rheede truly says that the Cashew-nut is abundant on the Malabar Coast, Rheede only quotes one name which seems to be Indian—*kapa mava*; all others are derived from the American name.

* Part I, pp. 73-74, 1893.

† In India it is pronounced as *Mundirikai* (vide p. 72, “Five Hundred Indian Plants,” by C. Stolz, 1891, Managalore Basel Mission Book and Tract Depository). It is known as *Gerumavu* in Dharwar, says Talbot (vide his Systematic List, 1894, p. 61).

‡ *Flore et Pomone de Java*, par Madame Berthe Hoola van Nooten, Brussels, 1866.

§ Our Tropical possessions in Malayan India, John Cameron, Esq., F.R.G.S., Appendix I, p. 399, 1865.

|| Kurz, Forest Flora British Burma, vol. I, p. 311.

I have, I think, sufficiently indicated in the foregoing remarks that the Cashew-nut plant is an exotic naturalized in the entire Eastern tropics. As already observed, the ancient Sanskrit writers make no mention of it. In the Sanskrit-French Dictionary of Burnouf and Leupol (Paris, 1856), and in the still more recent Sanskrit Wörterbuch of Otto Böthlingk (*Petersburg*, 1879), no Sanskrit equivalent of *Anacardium occidentale* is to be found. Both these dictionaries are replete with names of Indian plants with their botanical equivalents. The plant is not mentioned in Raj-Nighant, nor is it to be found in Madan Pal-Nighant. There is no reference to it in Dhanvantari-Naghanta either. The only reference to it in Sanskrit that I find is a solitary *shloka* quoted by three different compilers. The works of these compilers are of very recent dates, namely :—(1) *Nighant Ratnakar*, published in 1867 (Bombay); (2) *Gunadosha Prakash*, published in 1892 (Poona); (3) *Nighanta Sangrah*, published in 1893 at Junagadh, by Raghunath Indrajī *alias* Kata Bhat. This learned writer, in citing a passage mentioning some of the qualities of the plant, refers the passage to *Bhav Prakash*; but I am at the present moment unable to verify this quotation. Even supposing the passage is to be found in *Bhav Prakash*, it being a recent work, it would in no way militate against the fact that the Cashew-nut plant is in India an introduced plant.

Both Mr. T. N. Mukarji and the Rev. Mr. A. K. Nairne make the mistake of saying that the fleshy peduncle when fully developed is of only one colour. "It is of a bright scarlet colour," says the former;* "the fruit is red," says the latter.† As a matter of fact it is not only scarlet and red, but orange and lemon-coloured, with all the shades between. The tint ranges from light canary to the brightest scarlet one can imagine under the dazzling sun of the Indian sky. Baillon has said that "the colour is white, yellow, or red," according to variety. I have not seen a white *kaju* in this district; I may observe, however, that the colour, whatever it may be, is not determined *according to variety*, as Baillon supposes, for, on one and the same plant one may find the fully-developed fleshy peduncle in all shades of colour; often so, on one and the same branch. The colour is a mere matter of accident,

* Handbook of Indian Products, p. 74, 1883.

† The Flowering Plants of Western India, p. 68, 1894.

undetermined by variety. Balfour says that the fleshy peduncle is pea-shaped ; he evidently means pear-shaped. The juice is described by him as *very acrid*, and highly recommended in dropsical habits. As observed before, ideas differ with regard to the acrid nature or otherwise of the juice of the fully-developed fleshy peduncle. Some use the so-called fruit without much suffering ; others find it irritating and will not use it. Nairne observes that "though tempting to the eye, it is *excruciating* to the palate, though Oliver calls it edible." "The flavour," says Baillon, "is sourish or more or less acrid and astringent. Conserves are made from it, and particularly that famous *Fools' Confection* of Hoffmann the use of which, it was said, gave intelligence and memory to those most destitute of them." I am not aware of any such benign and beneficent property in the so-called fruit of kaju, else our village boys, who, notwithstanding its acidity, so largely and with such avidity use it throughout the period when the fruit is in season,—our village boys, I say, would be giants of intellect, proportionate with the quantity of fruit they consume! With regard to its use in Java, Madame Nooten says that "the fruit has a very tempting colour, but this fruit, so attractive to the eye, is not eatable." "It is true," she adds, "that the edible part is sometimes eaten by the Javanese, but they find few imitators on account of the sharp astringency of the juice which possesses a virulent principle." What that virulent principle is nobody has found out, so far as the acrid taste of the so-called fruit is concerned. I remember to have eaten the fruit myself as a boy with relish, though not without suffering from irritation of the throat lasting for some time after eating it. And I have not failed to appreciate it since. Though acrid, it is slightly sour, generally sweet, often *very* sweet, and having an aromatic odour which some may not like. A pinchful of common salt added to the sliced fruit, when eating, reduces the acidity. Baillon says that fermented drinks—wine, alcohol, and vinegar—may be extracted from it. "In Brazil," says he, "it is called the Sarsaparilla of the poor, and used as sudorific, diuretic and antisypilitic." Through the good offices of Mr. M. C. Pereira of Bandra, I have been able to obtain for purely medicinal purposes a small quantity of a clear spirit (alcohol) obtained from the so-called kaju fruit. It was manufactured at Goa whence Mr. Pereira obtained a

small quantity of it for medical purposes. It is seldom if ever used internally. It has a sweetish aromatic taste, partaking of the flavour of the mature fruit; and it goes under the name of "*Kajuchi-Daru*."

With regard to the nuts of the Cashew, I have come across some very strange passages in a work on the Folklore of Plants by Richard Folkard. He says* that the nuts are supposed by the West Indians to excite the passions. The later Hindu writers I have mentioned above recognize some such property in general terms. "The Negroes of the West Indies say," observes Folkard, "that a branch of the Cashew-nut tree supplied the crown of thorns used at our Saviour's crucifixion, and that, in consequence, one of the bright golden petals of the flower became black and bloodstained." The spirit of profanity "could no further go!" Well may I exclaim so. Judging from the circumstance that the crucifixion of Christ occurred several centuries before the plant was introduced into the Eastern tropics from the Western World, and noting the stern botanical fact that the flower of the Cashew-nut plant has neither "a bright golden petal" nor a black stain thereon, albeit the fact that its petals have crimson streaks, call them "blood-stained" if you will, Folkard's reference must be taken to be an utter myth, the product of a fertile but vitiated brain on the wrong side of the border-land of insanity. The plant has luckily no thorns to have any such unhallowed claim to have formed a part of the cruel and cursed "crown of thorns" that touched the brow of a saintly being and superbly sacred person in the last agonies of his earthly career.

Madame Nooten mistakingly supposes that a resin is obtained from the kernel. She is not a botanist, and is only writing from second-hand information. But she evidently refers to the resin from the pericarp. She is, however, right in saying that the resin "furnishes a more efficacious vesicatory than the Spanish fly or cantharides." But of this more later on. "The bark," says she, "contains a gum sold in Europe under the name of 'Cashew,' which," she adds, "is said to be a preservative against white ants." I think Madame Nooten is rather "mixed up" here. For, as Kanny Lal Dey, of Calcutta, says, it is the oleo-resin from the mesocarp that is applied to floors and rafters of houses to prevent the attacks of white ants and other

insects. The gum from the bark which Madame refers to is quite different in kind. It possesses no insecticide properties. It is free from the acidity which strongly characterizes the oleo-resinous product from the mesocarp of the nut. The gum from the bark consists chiefly of bassorine, common gum and gallic acid. It swells to a considerable size, but does not dissolve in water.* Balfour says "it forms a good substitute for gum arabic. In South America, bookbinders wash books with a solution of the gum in order to keep away the moths and ants." If it be a substitute for gum arabic, which has no insecticide properties, I cannot understand how it can keep off moths and ants. On the contrary ordinary gum arabic invites some kinds of ants. "The gum," says Balfour,† "should be collected when the sap is rising ; 5-12 lbs. can be collected annually." Observe that Balfour further notes that the seeds are used to flavour Madeira wine.

There is a very strange series of remarks in Mr. T. N. Mukarji's "Hand Book of Indian Products" (*vide* p. 74), which must not be allowed to pass unnoticed here. They are all the more strange because he is supposed to know what he is writing about. "The kernel," says he, "when raw is *exceedingly acid*" (the italics are mine—K.R.K.); "but when boiled it forms a delicious article of food." Nothing of the kind. There is not the slightest acidity about the unboiled "kernel." Boiled or unboiled, it is equally delicious. True, some would consider the boiled or roasted kernel *more delicious*. Further, Mr. Mukarji says that "the oil of the *nut* is used as an anæsthetic in leprosy with advantage." Note that Mr. Mukarji is not a medical man of any pretensions. He is a layman. Let him understand that it is not the *oil of the nut*, but the *oleo-resinous product from the mesocarp of the nut*, or the true botanical fruit that is used in leprosy ; and that too, not as an anæsthetic, but as an acknowledged remedy against the anæsthetic form of leprosy—*ergo*, as a cure for *anæsthesia*. It is strange that an oriental writer, knowing the plant well, should fall into such errors. He is merely a compiler.

As Rai Bahadur Kanny Lal Dey truly observes in his "Indigenous Drugs of India," the oil extracted from the kernel "by expression is

* O'Shaughnessy's Bengal Dispensatory, p. 281.

† Timber Trees of India, p. 19.

exactly similar to olive oil, sweet and agreeable." I may add that it is free from any of the slightest acidity whatsoever. It is nutrient and emollient. Its specific gravity is said to be 0.9160. It is soluble in ether, and partially in alcohol. The seed gets rancid when left over a rainy season. It loses its bland taste. To obtain good oil, the seed must be taken fresh. The black oleo-resin from the meso-carp is alone acrid. It is quite different from the oil of the kernel. Balfour goes to the extent of even saying that oil from the kernel is *superior* to olive oil or almond oil. I am prepared to endorse this view to the fullest extent. The sugared kernel known in the Bombay native sweetmeat-sellers' shops and to our children as *kaju golá* is a familiar article in our local "fairs." Children visiting such "fairs," which are not uncommon in Bombay throughout the year on "full moon" or "no moon" nights,* are only too glad to invest their pice in purchasing sugared *kaju gola* as their desired *bon bouche*, among other things, on such festive visits. They would not eat the sugared kernels of *kaju*, if they possessed the slightest trace of acidity, no matter how much sugar might be used to cover it. The tender and highly sensitive throats of children would at once rebel against the use of an acrid sweetmeat under the disguise of sugar.

But to pass on from the kernel to the plumule. It is not very easy for me to understand how it is that Gaertner says that the *plumule* is *absent* from the seed of the cashew-nut.† He describes the plumule as the first bud or "gemma" of the new plant. Further, under the head of *Simple buds*, which he describes as having sessile leaflets, he says that "they are opposite and ovate-acuminate in the *Anacardium*, *Sitodium*, *Corylium*." It is difficult to reconcile these two statements. Besides, from a personal examination of the seed, I find that there is a plumule, and a well-marked one too, answering the description Gaertner has given in his General Introduction, namely, "having sessile leaflets;" although in the body of his work (vol. I, p. 193), in describing the fruit of *Anacardium occidentale*, he asserts that *there is no plumule*. If the plumule is said to exist in the genus, it must be taken to be existent in all the species thereof, unless specially excepted. No such

* The *full moon* night in *Indian lunar months* falls at the end of the first half of the lunar month; the *no moon* night falls at the end of the second half of the same month.—K.R.K.

† *Vide* p. CLXVIII, General Introduction, De Fruct et Sem., Vol. I.

exception seems to be made by Gaertner in either his General Introduction or his particular description of the Kaju plant. As a matter of fact the plumule does exist, although I quite admit it is likely to be absent from ill-developed seeds. Such a contingency is very likely to occur where exotic plants are considered and examined in all stages of development, possibly non-development of special organs, under skies where they do not grow, and where the examiner has to trust to dried specimens, in all stages of decay, and ravages of insects.

POISONOUS PROPERTIES.

The poisonous properties of the plant exist in the acrid oleo-resin found in the mesocarp of the nut. Its composition is said to be the same as that of the oleo-resin found in a mesocarp of its congener—*Semecarpus anacardium* described in a former contribution to this Journal.* It contains cardol and a fatty acid called anacardic acid. Dr. Dragendorff, Professor of Pharmacy in the University of Dorpat, Russia, distinctly observes that cardol possesses powerful vesicant properties which are not shared by anacardic acid. "Cardol is a colourless oil, accompanying anacardic acid," says Dr. Dragendorff.† "It is soluble in alcohol and ether, but not in water. It can be removed from suspension in water by agitation with chloroform. Contact with dilute potash for a short time does not result in the loss of the vesicant property of cardol, as is the case, when the alkali is concentrated, and the action prolonged. The observation of the Rev. Mr. Nairne that the shell of the nut contains a very acrid oil, from which anacardic acid is made, is not sufficiently accurate. In the article communicated by Mrs. Ida R. Brigham to the "London Pharmaceutical Journal and Transactions,"‡ I find that, according to Professor Staedler, in addition to cardol and anacardic acid, the oleo-resin of the Cashew-nut contains "a little of an ammonium compound." What this compound is, is not mentioned. Staedler, however, assures us that it is not irritant; nor is anacardic acid irritant according to him. Cardol has a "faint pleasant odour when warmed." It is, in my opinion, anything but pleasant. It is positively irritating—a fact which will be easily remembered by

* *Vide* Vol. IX, pp. 235-258.

† Plant Analysis—Qualitative and Quantitative. Translated from the German by H. G. Greenish, F.I.C., London, p. 146, 1884.

‡ P. 708, vol. XII, 1881-82, 5rd Series.

those who have ever found themselves in the close vicinity of a place where the nut is being roasted. Dr. Dymock and his colleagues quote* the observation of Buchheim who says that the oleo-resin has a very faint and hardly acrid taste, and that three or four drops of it can be swallowed without marked effect. They also refer to Dr. Brassac's opinion regarding the quality of the oleo-resin in the following terms :—"Dr. Brassac considers it to be a good, rapid and safe vesicant, producing a copious flow of serum, and notable reduction of hypertrophy in tubercular leprosy." The cases which I quote below will show that it is not always a safe vesicant in some healthy men, as it produces much constitutional disturbance and affects healthy parts of the human body far removed from the places which originally came in contact with the oleo-resin. This proves the volatile nature of cardol. There is no doubt that it irritates the healthy skin often to a dangerous degree, producing not only vesication but regular eczematous inflammation of the skin. The anæsthetic skin of the leper is unable to appreciate the irritant property. "Cardol," says Dr. Dymock, "seems to be excreted with the urine, but partially also with fæces." This shows that cardol is a stable compound. The oleo-resin leaves a stain on linen, but it does not appear that the stain has the permanency so characteristic of the marking-nut. The oleo-resinous liquid, which is of a dark brown colour, contains 90 per cent. of anacardic acid and 10 per cent. of cardol. Dr. Lyon says that "the Cashew-nut juice," meaning, I presume, the oleo-resin, "appears to be seldom, if ever, used criminally in India." Dr. Newton, however, in the "Pharmacopœia of India"† says that native women use the juice to produce abortion, applying it to the *os uteri*."

Recorded evidence, however, is sufficiently strong to prove the vesicating properties of the oleo-resin. The Rev. Mr. Nairne seems to doubt this. Observe what he says‡ in quoting Kingsley's remark to the effect that the fumes of the acrid oil "will blister the face if the cook bends over the fire." Mr. Nairne emphatically says, "I never heard of this difficulty in India." Mr. Nairne may not have heard of it but the belief is common on this side of India, and not unfounded on actual experience, that the process of roasting the cashew-nuts is

* Pharmacographia Indica, vol. I, p. 387.

† Medical Jurisprudence for India, p. 192, 1889.

‡ The Flowering Plants of India, p. 68.

not always free from danger. Where the nut is being roasted, its acrid, irritating fumes are unmistakably noticeable. Popular belief goes still further. Some think that the penetrating odour has the power to kill even horses. This, however, must be considered an exaggerated idea of the acidity of the vapour emanating from nuts undergoing the process of roasting. The oleo-resin has the reputation of being a vermicide, as well as an insecticide, which latter property has already been referred to.

Dr. W. Hamilton* says that the oleo-resin is of such a causticity as to blister the lips of those who incautiously suffer it to approach them ; on this account these nuts are never eaten till after they have been well-roasted to dissipate the oil from the pericarp. After this, they may be used with impunity.

To test the action of the oleo-resin, Mrs. Brigham says, Professor Staedler "spread it over about one square inch of the surface of the breast, and covered it with a piece of blotting paper, also moistened with it. In the course of fifteen minutes a slight burning was perceptible, which rapidly increased, and attained its greatest energy in half an hour. The skin beneath the paper had become whitish surrounded by a red circle. The paper was allowed to remain in contact with the skin for three hours, which was then covered with thin vesicles that increased in size during the night, without, however, attaining the size of those usually produced by cantharides"; and yet we have the testimony of Madame Nooten, as already noted, that the oleo-resin (which she wrongly says is obtained from the *kernel*) furnishes "a more efficacious vesicatory than the Spanish fly or cantharides." The affected part in Professor Staedler's experiment was not only very slow in healing, but the after-effects continued for a long time. "A second experiment made with the liquid, which had been treated with dilute hydrochloric acid, afforded the same result."

Mrs. Brigham adds that "Henry W. Worthington states that he could fully corroborate the statement of writers concerning the irritant properties of the oleo-resin of the Cashew-nut, having himself seriously suffered from its effects while extracting it from bruised nuts by ether and subsequent evaporation. The United States Dispensatory notes a case of a lady who was exposed to the

* Pharm. Journal, vol. V, p. 269, 1845-46.

fumes of the nut while roasting. Her face was so swollen that not a feature was discernible for several days. A similar case occurred in a boy, who cut open one of the nuts, eating a small portion raw, and by handling it, spread the juice over the different parts of the body. "The tongue, face, neck, hands, forearms, &c., were enormously swollen, red and very painful." In this very able thesis which Mrs. Brigham presented to the Massachusetts College of Pharmacy in 1878, she further states how she and her husband, both ignorant of the poisonous quality of the nut-shell, suffered very seriously from skin eruption while incautiously attempting to break the shell with their teeth. While attempting to extract the vesicating principles, Mrs. Brigham, in spite of the elaborate precautions of encasing her hands with rubber and of using instruments, suffered from vesication of her right cheek, whereon a small particle of the juice found its way. The result was that instantly a slight burning was felt. "As quickly as possible," she says, "the poison was washed away with water, and to prevent any minute particle from adhering, again washed with ether." But the mischief was done, and she suffered. It is hardly necessary for me to enter here fully into the details of what the fair experimenter had to pass through for the next eleven days and more. Suffice it to say that vesication was the result. The face was so disfigured "as to be unrecognizable to the most intimate friends." Hands, fingers included, suffered from a vesicular eruption attended with oedema; other parts of the body suffered in their wake. Mrs. Brigham closes her very interesting thesis with the warning words of science. These words will not suffer, I am sure, in being reproduced here as the guiding voice of bitter and painful personal experience. "Several authors," says she, "speak of its use (meaning the use of the oleoresin—K.R.K.) for the removal of warts, corns and callosities, and some as a vesicant instead of cantharides. Considering the almost *infinitesimal* quantity of the poison which could have been absorbed in my personal attack and the gravity of the results, it would seem, in my judgment, to be unwarranted to apply a remedy so uncontrollable in cases where many other standard remedies might be used, which are not open to such objection." I am not disposed to underrate the value of this painful personal narrative, but it appears that these graphically described sufferings of both the husband and wife are singular in the

extreme. They are by no means, however, what may be considered "unexpected." Some may escape the virulent action of a violent poison. It is best, however, from a scientific point of view, to recognize the possibility of serious suffering from the incautious use or handling, even if it were for experimental purposes, of the Cashew-nut oleo-resin.

Let me now proceed to the consideration of a case of poisoning by the Cashew-nut, reported in an American Journal * edited by Horatio C. Wood and Robert Meade Smith. It is stated in this journal that "In 1881 a gentleman connected with the United States National Museum while organizing the Materia Medica collection, came across some nuts unlabelled. He sawed one of them through to make a specimen, and got some of the tar-like substance between the shell and kernel on his hands." What I would say is :—Would-be-arrangers of Materia Medica Museums beware ! for see what happened thereafter. "A few days after, † the face and hands became violently inflamed, a vesicular eruption accompanying the inflammation and intense itching. The face was of deep orange colour, eyes closed by swelling. The inflammation extended to the edge of, but not to, the scalp." Fearful ordeal this ! The poor sufferer went through his agonies "confined to the house for a week" (it might have been longer) suffering from intolerable itching. In ten days he recovered, the skin desquamating from the affected parts. The nuts were afterwards identified as Cashew-nut. "The affection corresponded exactly with the Rhus poisoning" says Dr. Prentiss, M.D., Washington, who records the case together with two other cases of poisoning from the congener of the Cashew-nut, *R. vernicifera* and *R. toxicodendron*. Be it noted to the discredit of Homœopathy that one of the cases of poisoning from *R. vernicifera* occurred as the result of an administration of a Homœopathic pellet labelled "Rhus." The other occurred from the Japanese lacquer, the sap of *R. toxicodendron*. Vesicular eruption accompanied with swelling is the prevailing characteristic of such irritation. The learned Professor wrongly says in this paper that there are two species of the Cashew-nut—*Anacardium occidentale* and *A. orientale*. My readers are already aware that *A. orientale* is not a species of the Cashew-nut plant, but a distinct genus described by me as *Semecarpus anacardium* in a former volume of this Journal.

* The Therapeutic Gazette, p. 448, vol. v, 3rd Series, Whole Series, volume xiii, 1889.

† There is seldom such delay in the development of the consequences, for, though the vesicating element is evanescent, the effect is quick generally speaking. There may be skins, however, which are slow in being acted upon, as there are brains slow in "taking in an idea."

NOTES ON SOME BIRDS FROM THE RUBY MINES DISTRICT, BURMA.

BY EUGENE W. OATES.

(Read before the Bombay Natural History Society on 19th Sept., 1895.)

During a tour of inspection of the buildings and roads in the Ruby Mines District last April, I made a note of all the birds I was able to procure or observe; and a list of them will, no doubt, be of interest. No one has yet collected in this particular locality which, by reason of its elevation, is likely to yield good results. The birds I now record are very few in number, but many of them are of great rarity, and the range of others has been very considerably extended to the east.

The Ruby Mines District lies to the east of the Irrawaddy river and between the Mandalay and Bhamo Districts. A road leads from the left bank of the Irrawaddy to Mogoke, the head-quarters of the district, a distance of sixty miles. At the fortieth mile a branch road leads to Bernardmyo, a small cantonment garrisoned by British troops. This branch road is twenty miles in length. Bernardmyo and Mogoke are connected by a mule track ten miles long.

The birds I am about to record were obtained or noticed in the triangle, of which the corners are represented by Kabein at the fortieth mile, Bernardmyo and Mogoke. This triangle is very mountainous and varies from about 4,000 to 7,500 feet in elevation. Toung-may or the Black Mountain is the highest point, and lies between Bernardmyo and Mogoke. I passed over the spurs of this mountain, but I had no time to collect birds. It appeared to me to be one of the best collecting grounds I have ever seen, being densely wooded with abundance of water.

Mogoke is a large and prosperous town, lying in a valley and entirely given up to ruby mining. All other industries appear to be neglected and the necessities of life command very high prices. Any three men combining together can get a small grant of land for sixty rupees a month to dig for rubies. The whole operation consists in sinking a well till the ruby-bearing stratum of earth (of a peculiar yellowish colour) is reached and in washing the earth. Three men are necessary for well sinking, and a license is not issued to a smaller party. Well-sinking is the usual method adopted by the natives in their search for rubies ;

but the Ruby Mines Company works on a much larger scale by opening out a hill-side or excavating a huge hole or tank, which is kept free from water by steam pumping machinery. The ruby-bearing earth is carried away by tramway and washed in elaborate machines. The final result is a collection of rubies, pebbles and gems of various kinds, which are carefully sorted by a trusted agent of the Company.

Bernardmyo is a small cantonment with accommodation for two companies of British Infantry. Its elevation is 5,500 feet. The cold is considerable in the winter and the rains are very heavy, but it has proved a healthy place. There are very few native inhabitants at Bernardmyo now, but at one time it must have been well populated, for the forest for miles round has been cleared away and the soil cultivated. The hills are now covered with a thick growth of grass and bracken, and the former inhabitants have migrated elsewhere.

My list of birds is very small, but it would have been much smaller had it not been for the kind assistance of Captain E. W. Mills, Commanding the troops at Bernardmyo, Mr. F. Atlay, the Manager of the Ruby Mines Company, and Mr. C. H. Wollaston, Executive Engineer. These gentlemen did their best to help me, and each of them procured some birds which I failed to observe myself.

The following list comprises forty-six species only :—

1. *Corvus macrorhynchus*, Wagl., the jungle-crow, was universally distributed.
2. *Corvus insolens*, Hume, the Burmese house-crow, was not very abundant at Mogoke, and I am not sure that I saw it at Bernardmyo at all.
3. *Pica rustica*, Scop., the magpie, was frequently seen. It also occurs much farther south at Toungyi in the Southern Shan States.
4. *Urocissa occipitalis*, Blyth, the red-billed blue magpie, was common in the well-wooded parts of the country.
5. *Parus minor*, Temm. and Schleg., the Japanese grey tit, was common.
6. *Paradoxornis guttaticollis*, A. David, Austen's crow-tit, has already been recorded from Western China. Its occurrence therefore at the Ruby Mines was not unexpected. I found a pair at Bernardmyo in thick bracken on a hill-side. It has a pleasant call of four notes ; and secretes itself so well that it is most difficult to shoot.

7. *Dryonastes sannio*, Swinhoe, the white-browed laughing-thrush, was everywhere abundant. It is less shy than other birds of this family, and is frequently seen alone or in pairs.

8. *Pomatorhinus imberbis*, Salvad., the Eastern rusty-cheeked scimitar babbler, was common, but very difficult to secure.

9. *Chloropsis hardwickii*, Jard. and Selby, the orange-bellied chloropsis, was the only one of the genus procured.

10. *Molpastes burmannicus*, Sharpe, the Burmese red-vented bulbul, was everywhere common.

11. *Xanthixus flavescens*, Blyth.—I procured one specimen of Blyth's bulbul between Kabein and Bernardmyo.

12. *Otocompsa emeria*, Linn., the Bengal red-whiskered bulbul, was common.

13. *Pycnonotus xanthorrhous*, J. Anderson, Anderson's yellow-vented bulbul, was not uncommon. It also occurs in Karennee and at Kalaw in the Southern Shan States. A description of this bird will be found in a footnote at page 286 of the first volume of the Birds, "Fauna of India."

14. *Sitta nagaensis*, Godwin-Austen, Austen's nuthatch, was discovered on the Naga hills by Colonel Godwin-Austen. Its occurrence therefore in the Ruby Mines extends its range very considerably. Mr. Wollaston procured a single specimen at Bernardmyo.

15. *Dicrurus cineraceus*, Horsf., the grey drongo, occurred sparingly.

16. *Chibia hottentotta*, Linn., the hair-crested drongo, was very common.

17. *Orthotomus sutorius*, Forst., the Indian tailor-bird, was met with on one occasion only.

18. *Megalurus palustris*, Horsf., the striated marsh-warbler, was common in all the wet cultivated valleys, occurring in pairs and no doubt breeding in April.

19. *Phylloscopus indicus*, Jerd.,—Captain Mills secured one specimen of the olivaceous willow-warbler at Bernardmyo. It has not yet been recorded further east than Assam.

20. *Lanius nigriceps*, Frankl., the black-headed shrike, was extremely common.

21. *Artamus fuscus* Vieill.—Captain Mills assured me that the ashy swallow-shrike occurs in large flocks at Bernardmyo.

22. *Graculipica nigricollis*, Payk., the black-necked myna, was frequently seen.

23. *Acridotheres tristis*, Linn., the common myna, was seen throughout the tract.

24. *Æthiopsar grandis*, Moore., the Siamese myna, was obtained on one occasion near Mogoke.

25. *Pratincola caprata*, Linn., the common pied bush-chat, was everywhere common.

26. *Oreicola ferrea*, Hodgs., the dark-grey bushchat, was very common at the bungalow situated between Bernardmyo and Kabein.

27. *Copsychus saularis*, Linn., the magpie-robin, was universally distributed.

28. *Uroloncha acuticauda*, Hodgs., Hodgson's munia, was common in flocks on the roadsides.

29. *Passer montanus*, Linn., the tree-sparrow, was the only sparrow seen in the Ruby Mines.

30. *Emberiza pusilla*, Pall., the dwarf bunting, was very common in all the open country.

31. *Melophus melanicterus*, Gmel., the crested bunting, was abundant on the roads and open places.

32. *Hirundo smithii*, Leach., the wire-tailed swallow, was the common swallow of the Ruby Mines in April.

33. *Motacilla melanope*, Pall., the grey wagtail, was found in swampy places.

34. *Anthus maculatus*, Hodgs., the Indian tree-pipit, was very common.

35. *Dicaeum ignipectus*, Hodgs., the fire-breasted flower-pecker, was abundant in some trees near the bungalow between Bernardmyo and Kabein.

36. *Upupa indica*, Reich., the Indian hoopoe, was occasionally observed.

37. *Cuculus canorus*, Linn., the cuckoo, was very abundant, and its call was heard on all sides at all times of the day and frequently at night.

38. *Centropus sinensis*, Steph., the common coucal or crow-pheasant, was common. This is the form named *C. intermedius* by Hume. Blanford, however, informs me that he cannot separate the

larger Indian and Burmese crow-pheasants into two or more species, and he has included them all under the term *C. sinensis* in his forthcoming third volume of the Birds in the "Fauna of India."

39. *Spizaetus linnaetus*, Horsf.—A skin of the changeable hawk-eagle, procured in the neighbourhood, was shown me at Mogoke.

40. *Circus pilonotus*, Kaup.—A pair of the Chinese pied harriers were seen at Bernardmyo. The entire lower surface of the male, except the chin, was pure white.

41. *Francolinus chinensis*, Osbeck., the Chinese francolin, was everywhere common.

42. *Arboricola brunneipectus* Tick., Mr. Atlay shewed me a freshly killed specimen of the brown-breasted hill partridge, which he had shot near Katpyin.

43. *Gerronæus andersoni*, Elliott.—Anderson's silver pheasant was common throughout our area.

44. *Phasianus humie*, Hume.—Mrs. Hume's pheasant is no doubt fairly common about the Ruby Mines, but apparently very shy and difficult to get. Mr. Atlay very generously gave me a pair of skins of this very lovely species. The birds had been snared by a native. Mr. Hume discovered this bird in Manipur, and it is noteworthy as being the only species of true pheasant (*Phasianus*) which has hitherto been found within the strict limits of British India and Burma. I have deposited the skins given me by Mr. Atlay in the Natural History Museum, South Kensington.

45. *Gallus gallus*, Linn., the common jungle fowl, was abundant in the district.

46. *Scolopax rusticola*, Linn.—Captain Mills assured me that woodcocks were frequently shot near Bernardmyo.

THE RENDERING OF ANIMALS IMMUNE AGAINST THE VENOM OF THE COBRA AND OTHER SERPENTS,

AND ON

THE ANTIDOTAL PROPERTIES OF THE BLOOD SERUM OF THE IMMUNISED ANIMALS.

Communicated to the Royal Society of Edinburgh, June 3rd, 1895,

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(*Abstract.*)

TRADITIONS AS TO IMMUNITY.

One of the most striking and interesting of the many traditions and current beliefs regarding venomous serpents is that a power may be acquired of freely handling them without injury, and even of successfully resisting the poisonous effect of their bites. The Psylli of Africa, the Marsi of Italy, the Gouni of India, and other ancient tribes and sects were stated to have been immune against serpents' bites, and to have been able to exercise a remarkable influence over even the most venomous of these animals; and those attributes have been explained on the supposition that serpents' blood was present in the veins of the members of these tribes and sects. In more modern times, and, indeed, at the present day, the same belief is stated in the writings of travellers; and it has been expressed by poets and novelists, and, among the latter, with a half-admitted conviction of its reality, by Wendell Holmes in his *Romance of Destiny*.

It may be instructive to associate with this belief in the possession, under certain conditions, by human beings of a power successfully to resist the poisonous effects of serpents' venom, and with the evidences in its support, the further belief that venomous serpents are themselves protected against the effects of bites inflicted upon them by individuals both of their own and of other species. On mere anatomical grounds it is difficult to understand how serpents could escape the absorption of their own venom through mucous surfaces, even admitting that absorption of venom does not occur in normal conditions of these surfaces. Venom must, however, be so frequently introduced into their bodies, in situations where absorption could not fail to occur, by the bites inflicted upon them by other serpents, that the conclusion seems inevitable that they possess some protective quality, without which, probably, no venomous serpents would now be in existence. Not only have many general observations been made in support of this belief, but it has been proved to be correct by direct experiments, such as those made by Fontana of Tuscany more than a century ago, by Guyon, Lacerda, Waddell, Kaufmann and Sir Joseph Fayrer.

SOURCES OF SUPPLY.

India.—I received my first supply of cobra venom in 1889 from Surgeon-Colonel Moir, lately of Meerut, and soon afterwards—also in small quantities—from the late Dr. Shortt, and from Sir Joseph Payrer, the Thakore of Gondal, and Dr. Phillips. Larger quantities were subsequently obtained from Surgeon-Captain French, and through the kind efforts of Sir William Mackinnon, Director-General of the Army Medical Department, from each of the presidencies of India; and they had so far increased my stock as to enable me to begin experimental work towards the end of last year. Early in this year a large additional supply was received from Surgeon-Colonel Cunningham, of Calcutta, and this gentleman has quite recently sent a further large quantity of several grammes of dry venom.

America.—Besides these specimens of the venom of the cobra of India, I have also been fortunate in obtaining specimens of venoms from other parts of the world. From America, Dr. Weir Mitchell, of Philadelphia—whose work on the chemistry and physiology of serpents' venom constitutes the great advance of the century on the venom of viperine serpents—has supplied me with the venom of three species of rattlesnakes; namely, *Crotalus horridus*, *C. adamanteus* and *C. durissus*, and also with a specimen of the venom of the copper head (*Trigonocephalus contortrix*).

Australia.—Dr. Thomas Brancroft, of Brisbane, has at various times sent specimens of the venoms of the black snake (*Pseudechis prophyriacus*), the brown snake (*Diemenia superciliosa*), and of a large unidentified snake of the Diamantina district of South Australia (probably a new species of *Diemenia*).

Africa.—The kindness of Mr. William Smith, a distinguished naturalist of Cape Town, of Dr. Brook, of the Orange Free States, and of Dr. John Murray and Mr. Van Putten, of Cape Colony, has placed at my disposal small quantities of the venom of the puff adder (*Vipera arietans*), the night adder (*Aspidelaps lubricus*), the yellow cobra (*Naja haie*), and the "Ring Hals Slang" or "Rinkas" (*Sepedon hamachates*); and Dr. John Anderson, formerly Professor of Natural History at Calcutta, has only last week forwarded to me living specimens of the *Vipera cerastes*, to be followed by living specimens of the cobra, which his present connection with the zoology of Egypt has given him peculiar facilities to obtain.

In the meantime, however, further evidence has been obtained in support of the reality of the probabilities to which I have referred. Sewall using the venom of the rattlesnake, Kanthack that of the cobra, and Kaufmann, Phisalix and Bertrand that of the viper, obtained experimental evidence of the possibility of producing by "inoculation" a certain slight degree of resistance against the toxic effects of these venoms. The relationship of such observations to the recent discoveries in connection with the toxins of tetanus, diphtheria, and other diseases could not long remain unrecognised. Dr. Brancroft and others have recently suggested "that the blood of animals rendered immune to snake venom might be found of service as a remedy in snakebite." Within the last few months Phisalix and Bertrand have obtained experimental indications of the antidotal power of the blood serum of animals immunised, but only to a low degree, against the venom of vipers; while Calmette, working in the Pasteur Institute of Paris, after several unsuccessful endeavours had led him to express the opinion that immunity against snake venom could not be produced, afterwards succeeded in obtaining evidence of its production, and of the power of the blood serum to counteract the effects of venom.

VARIETIES OF VENOM USED.

In this the first portion of the investigation the venoms that have been used are only four in number—those, namely, of the cobra of India (*Naia tripudians*), of the *Crotalus horridus* of America, of a large colubrine snake, probably a species of *Diemenia*, from South Australia, and of the *Spedon hæmachates* of Africa. The venoms are therefore those of the most deadly of the poisonous serpents of Asia, America, Australia, and Africa respectively; and further, they are representative of the chief differences that occur in the composition and action of venoms, for they are derived from members of the two great groups of the colubrine and viperine serpents.¹

An essential preliminary to exact investigations with active substances must always be the determination of the activity of the substances. The only convenient method for doing this is to define the smallest dose capable of producing death for any given weight of animal—that is, the minimum lethal dose. The venoms in their natural state are inconstant in activity, mainly because of variations in the quantity of the water which they contain. The cobra venom has, however, nearly always been received in the form of a dry solid, but when this was not so it has been dried *in vacuo* over sulphuric acid.

Outside of India there are few persons skilled in the hazardous task of taking venom directly from living serpents. Accordingly, with few exceptions, the other venoms were not received in a pure form, but in the form of the dried venom glands. From these glands, however, the poisonous constituents may easily be extracted with water, and on evaporating the solution over sulphuric acid an active dry venom was obtained, containing however other substances besides those which are active. I am not in a position, therefore, to make any statement in regard to the relative activity of the different venoms. For the objects in view what only is necessary is that the exact minimum lethal dose of each venom used should be known, whether it be pure or diluted with a certain small amount of inert matter. Each of the four venoms was, however, found to be very active, but the cobra venom especially so.

LETHAL DOSES.

Experiments were made with it on several animals—as the guinea-pig, rabbit, white rat, cat, and the innocuous grass snake of Italy (*Tropidonotus natrix*). Very considerable differences were found to occur in the minimum lethal dose for each of these animals. For the guinea-pig the minimum lethal dose per kilogramme was 0·00018 g.; for the rabbit, 0·000245 g.; for the white rat, 0·00025 g.; for the cat somewhat less than 0·005 g.; for the kitten (6 weeks old), 0·002 g.; and for the grass snake the relatively larger dose of 0·03 g.

¹ My supply of cobra venom being much larger than that of any of the others, this venom was chiefly used in the experiments; and in all of those to be referred to the administration was effected by subcutaneous injection.

Cobra venom thus takes a position among the most active of known substances, rivalling in its lethal power the most potent of the vegetable active principles, such as aconitine, strophanthin, or acokantherin.

These facts having been ascertained, attempts were next made to render animals proof against lethal doses by administering to them a succession of gradually increasing non-lethal doses. These were, for the first few doses, in some of the experiments, one-tenth of the minimum lethal; in others one-fifth; in others one-half of the minimum lethal; and in others almost as great as the minimum lethal. At varying intervals the doses were repeated and by-and-by gradually increased, until the actual minimum lethal dose had been attained. The subsequent doses, by gradual increments, exceeded the minimum lethal, and after five or six times the minimum lethal had been reached, it was found that the increments could be increased, so that each became twice, four times, and latterly even five times the minimum lethal, and still the animal suffered little and, in many cases, no appreciable injury.

Many failures occurred before experience indicated the precautions and conditions that are necessary for success. Serpents' venom exerts what may broadly be described as a duplex action. It produces unseen functional disturbances, and it also produces visible changes. The latter are of a highly irritative character, causing intense congestion in the lungs, kidneys, and other organs, and, when given by subcutaneous injection, on all the structures of the skin and subjacent parts. There are apparently also some definite changes produced in the blood, with regard to which several important facts have been discovered by Dr. Martin, of the University of Sydney. Irritative effects are obviously produced by cobra venom, even in non-lethal doses and with greatly increased virulence by doses that exceed the minimum lethal; but, in respect to this action, the other three venoms used are greatly more active than the venom of the cobra. Evidence was obtained to indicate that in the process of immunisation a diminution occurs in the intensity of these local actions; but this diminution does not proceed so rapidly as that in the unseen functional or other changes which are the more direct causes of death; and, further, the local irritative changes, after having been produced, are slower to disappear than the unseen functional disturbances. Until these facts had been appreciated, and, indeed, even with the adoption of the precautions suggested by them, frequent failures occurred. The apparently contradictory results accordingly were obtained of the production, by gradually increasing doses, on the one hand, of a protection against quantities much above the minimum lethal, so perfect that no apparent injury was caused; and, on the other hand, of an intolerance so decided that death was produced by the last of a succession of gradually increasing doses, no one of which was so great as the minimum lethal. The latter unfortunate event was frequently displayed in guinea-pigs, and attempts to carry immunisation in them to a high point were found to be extremely difficult.

ARTIFICIAL IMMUNITY.

Notwithstanding these difficulties however, such gratifying results have been obtained as that rabbits could at last receive by subcutaneous injection so much as ten, twenty, thirty, and even the remarkable quantity of fifty times the minimum lethal dose without manifesting any obvious symptoms of poisoning.

Almost the only observable phenomena were a rise in the body temperature, which continued for a few hours after the injection, and which contrasts with the fall that occurs after the administration of even non-lethal doses in non-protected animals, and a loss of appetite which usually, though not invariably, occurred, and was probably the cause of a temporary fall in weight during the day or two days succeeding each injection. On the other hand during the process of successful immunisation the animals increased in weight, they fed well, and appeared to acquire increased vigour and liveliness. This has been frequently exemplified in the smaller animals, such as rabbits; and also, very conspicuously, in an aged and previously sedate horse, which in the process of immunisation has now received ten times the estimated minimum lethal dose.

It is marvellous to observe these evidences of the absence of injurious effects and even of the production of benefit in an animal which, for instance, has received in one single dose a quantity of venom sufficient to kill, in less than two hours, fifty animals of the same weight, and in the course of five or six months a total quantity of venom sufficient to destroy the lives of 370 animals of the same species and weight.

With the cobra venom I have also immunised cats, both by subcutaneous and by stomach administration; but the significance of the latter method of administration must be reserved for a future communication. As I have stated, a horse is also being immunised; and I have to express my obligations to Principal Williams for granting me the accommodation of his establishment, and to Professor Davis, also of the New Veterinary College, for much valuable assistance.

Following the same plan of research with the three other venoms, it was found that the minimum lethal dose per kilogramme for rabbits of the diamantina venom is 0·0015 g.; of the venom of *Sepedon hæmachates* 0·0025 g.; and of the venom of *Crotalus* 0·004 g.² The *Crotalus* venom is, in its purity, altogether comparable with the cobra venom; and the determinations, therefore, show that cobra venom is sixteen times more powerful than *crotalus* or rattlesnake venom. This venom, as well as the two others, however, much exceed cobra venom in the intensity of their local action. When death is produced by *crotalus* venom, the subcutaneous tissues became extensively infiltrated with a large quantity of blood and of blood-stained serum, the

² Diamantina venom, 1½ mg.; *Sepedon hæmachates*, 2½ mg.; *Crotalus horridus*, 4 mg.

underlying muscles are reduced to an almost pulpy blood-stained substance and *post-mortem* decomposition occurs very soon after death. Similar changes in the subcutaneous tissues, but to a rather less degree, are caused by the diamantina venom, and in addition hæmaturia, or more probably hæmoglobi-nuria, was invariably produced by lethal and even by large non-lethal doses. I mention these circumstances to indicate the perfection of the protection which is produced by the administration of successive gradually-increasing doses ; for they can be so adjusted that a dose of each venom, even three times larger than the minimum lethal, may be administered without producing more than an inconsiderable and even scarcely observable degree of local destructive effect.

In the meantime, the process of protection with these latter venoms has not advanced further than three times the minimum lethal dose. This, however, has been sufficient to allow experiments to be made by which it has been demonstrated that when an animal has acquired a resistant power over the minimum lethal dose of one venom, that animal is also able successfully to resist the lethal action of a dose above the minimum lethal of other venoms. To a rabbit immunised by cobra venom, a dose above the minimum lethal of sepedon venom has been administered ; to rabbits immunised with crotalus venom, doses above the minimum lethal of diamantina and of cobra venoms have been given ; to animals immunised above the minimum lethal with the diamantina venom, doses above the minimum lethal of crotalus and sepedon venom have been given ; and in each case the animal has recovered, and but few symptoms of injury were produced. At the same time, in other experiments, indications were obtained that animals immunised with a given venom are capable of resisting the toxic effect of that venom more effectually than the toxic effects of other venoms.

DURATION OF IMMUNITY.

My experiments have not yet proceeded sufficiently far to show for what length of time the protection conferred by any final lethal dose may last. I propose to make some experiments which will give definite information in regard to this point, which may possibly lead to practical applications. It has incidentally been discovered, however, that protection lasts for at least a considerable period of time, even when the last protective dose has not been a large one. For example, to a rabbit which had last received twice the minimum lethal dose of crotalus venom, the same dose was administered twenty days subsequently, and it altogether failed to produce any toxic symptoms.

As yet no sufficient data have been obtained for affording an explanation of these remarkable facts. It is obvious that the blood of protected animals must contain some substance or substances which are not present in the non-protected animals, by which the lethal and toxic effects of venoms are pre-

vented. When the blood serum of protected animals is added to a solution of venom a distinctly observable reaction occurs, and this reaction may be of significance when considered along with circumstances which will be stated in the remaining part of this communication, and especially with the circumstance that the blood serum is itself almost destitute of physiological activity. This protective substance may be produced in the body by the influence of the venom, but it is also conceivable that the substance is actually a part of the venom itself, which gradually accumulates under repeated administrations, whereas the lethal and toxic constituents of the venom are more rapidly destroyed or eliminated.

THE BLOOD SERUM OF IMMUNISED ANIMALS: ANTIVENENE.

Having thus succeeded in producing a high degree of protection in animals against the toxic effects of serpents' venom, the blood serum of these animals was, in the next place, collected for the purpose of testing its antidotal properties. A few preliminary experiments were, however, early made with the serum of animals in whom the protection had not been carried to a high degree, and they were sufficient to show that antidotal properties are possessed even by this serum. It soon became apparent that, in order to obtain some reasonable approximation to constancy in the conditions of the experiments, it was necessary that the serum should be in such a state that it would remain unchanged during at least several weeks. It was found that this could be ensured without any appreciable loss of antidotal power by drying the freshly-separated serum in the receiver of an air pump over sulphuric acid, after it had been passed through a Chamberland's filter. A perfectly dry and easily pulverisable solid was thus obtained, which could be kept unchanged for probably an indefinite time, and from which a normal serum could easily be prepared as required by merely dissolving a definite quantity of the dry serum in a definite quantity of water. To this serum, whether in the dry form or in solution, it would be convenient to apply the name "*antivenene*."

The greater number of the experiments now to be described were made with antivenene derived from the mixed serum of three rabbits, which had last received a dose of cobra venom equivalent to thirty times the minimum lethal. I avoid the expression "immunised against" thirty times the minimum lethal dose, for, as a matter of fact, an animal is always protected or immunised against a dose considerably above the last which it had received.

The experiments were so planned as to obtain in three or four different conditions as exact a definition as possible of the antidotal power of the antivenene. Four series of experiments have been undertaken on rabbits; but all the experiments required to complete two of these series have not yet been made. In one series the venom was mixed outside of the body with the antivenene, and immediately thereafter the mixture was injected under the skin of the animal; in the second series the venom and antivenene were

almost simultaneously injected into opposite sides of the body ; in the third series the antivenene was injected some considerable time before the venom ; and in the fourth series the venom was first injected, and thirty minutes afterwards the antivenene.

All, or nearly all, the experiments required to define the exact quantity of antivenene that is sufficient to prevent death from different lethal doses of venom have been as yet made only in the first and fourth of these series. They are, however, in some respects the most important of the series, as the conditions for exactitude in simultaneous administration are perfectly obtained in the first series, and it therefore should constitute the basis for comparison between antivenenes derived from different sources, and as upon the results of the fourth series must depend the actual practical application of antivenene in the treatment of poisoning by serpents' bites.

In the experiments of the first series the doses of cobra venom administered were the minimum lethal, twice the minimum lethal, and thrice the minimum lethal. In the case of each dose experiments were made with different quantities of antivenene so as to determine the quantity required to prevent death. In order to render it certain that a lethal dose was always administered in the experiments with the so-called minimum lethal, the minimum lethal indicated by the previous experiments was not used, but instead a slightly larger dose (0.00026 instead of 0.000245 g. per kilogramme).

When this certainly lethal dose, capable of causing death in five or six hours, was mixed with antivenene and the mixture then injected under the skin, it was found that so small quantities of antivenene were sufficient to prevent death as 0.5 c. cm., 0.25, 0.1, 0.05, 0.02, 0.01, 0.005, 0.004 c. cm. ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{40}$, $\frac{1}{80}$, $\frac{1}{160}$, $\frac{1}{320}$, of a c. cm.) for each kilogramme of the weight of the animal. With 0.0025 c. cm. ($\frac{1}{400}$), however, the animal died. The antivenene was therefore found to be so powerful as an antidote in the conditions of these experiments that even the $\frac{1}{320}$ part of a cubic centimetre, equivalent to about $\frac{1}{5}$ part of a minim, acted as an efficient antidote. Even with the smaller of these doses of antivenene there was almost no symptom of poisoning produced. In the experiments of this series with twice the minimum lethal dose recovery occurred when the doses of antivenene were 0.75 c. cm., 0.7 c. cm., and 0.6 c. cm. per kilogramme, but 0.5 c. cm. per kilogramme failed to prevent death. In the experiments with thrice the minimum lethal dose of venom (a dose capable of producing death in less than two hours) recovery occurred when the doses of antivenene were 1.5 c. cm. and 1 c. cm., but death occurred with 0.8 c. cm., and even the enormous dose of four times the minimum lethal failed to produce death, or, indeed, any observable disturbance, when it had previously been mixed with 2 c. cm. per kilogramme of antivenene.

In the *second* series experiments have been made only with twice the minimum lethal dose of venom. When this dose was injected into the subcutaneous tissue of one side of the body, and immediately thereafter a

dose of antivenene, it was found that doses of 1 c. cm., 2 c. cm., and 3 c. cm. per kilogramme failed to prevent death, but that 2.5 c. cm. and 3 c. cm. per kilogramme were able to do so.

In the *third* series the experiments have as yet been made with only the minimum lethal of cobra venom, and they show that 4 c. cm. per kilogramme of this antivenene is able to prevent death when given thirty minutes before the venom.

In the *fourth* series, where the results are likely to give the clearest indications of the antidotal value of antivenene, it was found that recovery occurred in the experiments in which 1.5 c. cm., 1 c. cm., and 0.8 c. cm. per kilogramme of antivenene were injected *thirty minutes after a certain* minimum lethal dose of venom; but that the antivenene was insufficient in quantity to prevent death when 0.75 c. cm. per kilogramme or less was administered. In this series, further, it was found that 5 c. cm. per kilogramme of antivenene was a sufficient dose to prevent death after twice the minimum lethal dose of venom, but that 2 c. cm., 2.5 c. cm., and 3 c. cm. per kilogramme were insufficient.

The experiments of this series are especially interesting, as nearly all the animals showed symptoms of poisoning before the antivenene had been administered. In each of the fatal experiments the duration of life was greatly prolonged by the administration of antivenene; and it is probable that in many instances a second injection of antivenene, made half an hour or an hour after the first, would have prevented death.

It has thus been established, on the clearest evidence, that the blood serum (antivenene) of animals protected against large lethal doses of venom is able, in varying conditions of administration, perfectly to prevent lethal doses of the venom of the most poisonous of serpents from producing death in non-protected animals.

In order to obtain some evidence bearing on the question as to whether the more powerful antivenene is produced by the long-continued administration of small non-lethal doses of venom, or by the administration of doses gradually increasing until a large lethal dose is reached, a few experiments were made with the serum of a rabbit which had received one-tenth of the minimum lethal dose nearly every two days during a period of three months and one week, and also of one which had received the one-fourth part of the minimum lethal dose nearly every four days during a period of three months and three weeks. I did not find that the antidotal power of the antivenenes obtained from these animals was great, or nearly so effective as the antivenenes obtained from animals which had finally received a dose much in excess of minimum lethal. When mixed with venom and then injected, 3 c. cm. per kilogramme of these antivenenes was insufficient to prevent death from somewhat more than the minimum lethal dose of venom, but 5 c. cm. per kilogramme were sufficient to do so.

I have also administered 1·5 c. cm. per kilogramme of cobra antivenene thirty minutes after a dose one-twelfth larger than the minimum lethal dose of the venoms, respectively, of the *Sepedon hæmachates*, the *Crotalus horridus*, and the *Diementina* serpent, and the rabbits experimented on have recovered. This successful result is all the more remarkable when the intensely destructive local effects of each, but especially of two, of these venoms is recollected.

The experiments establishing, and to some extent defining, the antidotal power of cobra venom, further, have been made on animals peculiarly susceptible to the poisonous action of serpents' venom, a circumstance of importance in considering the probable value of the antivenene when used as an antidote in the treatment of animals of less susceptibility, among whom there appears to be sufficient evidence to place human beings. The minimum lethal dose for man probably approximates that of the cat, rather than that of vegetable feeders, such as the rabbit, guinea-pig, and white rat.

It is also to be remembered that so far the experiments have been restricted to a definition of the antidotal power in certain conditions which were not always the most favourable for the mere prevention of death. Indications have indeed been obtained which render it highly probable that death may be prevented from occurring more certainly by several administrations rather than by one administration of antivenene, and also by the introduction of the antivenene into the same parts as the venom rather than into distant parts.

It would be important also to increase the number of the experiments with the larger of the lethal doses of venom as yet administered, and it may be to employ still larger doses, although, for practical application, the larger of the doses that have already been used, as they produce death in about an hour, need not be increased. To these purposes I hope to apply the antivenene soon to be prepared from the rabbits which have already received fifty times the minimum lethal doses of venom.

ANTIVENENE IN THE TREATMENT OF SNAKE-BITE IN MAN.

For the actual application of the antivenene to the treatment of snake-poisoning in man, an endeavour is being made to obtain the large quantity that is requisite from a horse now receiving considerable lethal doses of cobra venom. From this source, also, it is hoped that a sufficient quantity will be obtained to allow of the examination of the chemical properties of the antivenene to be continued, with the object of discovering the constituent or constituents by which the antidotal effects are produced. If the isolation of the antidotal constituent or constituents can be effected, an antivenene of greatly increased power will be obtained, and the range of efficient application will be increased. For these objects, however, it will be necessary to administer to the horse much larger doses than it has yet received; and the chief difficulty in doing this is to obtain a sufficient supply of cobra venom. By the great kindness of Surgeon-Colonel Cunningham 9 g. of dry venom

have already been obtained, but in order to carry the protection to fifty times the minimum lethal dose, another 30 g. would be required. I have reason to hope that the India Office will succeed in making arrangements for procuring even this large quantity.

The subject is one of practical importance to India, where the destruction of human life by venomous serpents is represented by an annual mortality of 20,000, and where the failure of all methods of treatment³ has led to the introduction of a system of extermination of venomous serpents—apparently futile in its results—in the carrying out of which large sums of money have been expended.

In considering the probabilities of success by antivenene treatment, it is also to be recollected that antivenene can be obtained even more powerful than that which was used in the experiments which have been described, and that, judging from the statistics of Fayrer and Wall, in 75 per cent. of fatal cases in man death does not occur until from three to twenty-four hours after the infliction of the bite. This latter fact appears to indicate that in the great majority of the fatal cases the dose of venom does not much exceed the actual minimum lethal, and, therefore, is not so large as the doses whose lethal action has been prevented from occurring in the experiments that have been described, in which, further, the conditions of success in preventing death were not the most favourable that could have been adopted.

It appears to me, however, that an interest and importance as great as that which can be derived from this practical application of the facts is to be found in their relation to the cause and treatment of many of the most fatal diseases—those, namely, which are produced by organisms that have found their way into the body. The evidence in favour of the curative value of the antitoxins derived from animals immunised against the toxins of these diseases seems to receive an additional confirmation from these facts. They also bring distinctly before us the circumstance that there are limits to this curative power dependent on the dose of the toxin to be counteracted, on the special antidotal activity of the antitoxin that is used, and on the duration of the time during which the toxin has had an opportunity of exerting its poisonous action before the antitoxin is administered. If these and other conditions interfering with successful treatment are not determined and recognised, unmerited discredit is likely to be attached to remedies which alone of all remedies may be capable of preventing death in these diseases by counteracting the effects of minimum lethal and larger doses of the toxin.

³ "After long and repeated observation in India and subsequently in England, I am forced to the conclusion that all the remedies hitherto regarded as antidotes are absolutely without any specific effect on the condition produced by the poison."—Sir Joseph Fayrer on the *Nature of Snake Poison*.

DRIED LOCUSTS AS FOOD FOR CAGE AND GAME BIRDS.

Notes by Dr. A. Günther and Mr. E. C. Cotes.

In June, 1892, the Government of India received the following letter from Dr. A. Günther, of the British Museum, Natural History :—

“Some time ago it occurred to me that dried locusts might be utilised for insectivorous cage-birds and game-birds which are now reared at great expense on ant’s eggs.

“Last year I obtained from Cyprus about 200 lb. of oven and sun-dried locusts, and, having ascertained with my own birds on a small scale that the locusts are greedily eaten, I thought it best to offer the remainder to Messrs. Spratt, who have all the appliances for chemical analysis and experimental feeding and the requisite organisation abroad for collecting the material. They have sent me a very favourable report as regards the utility of the article as food.

“Before proceeding further in the matter, Messrs. Spratt are anxious to know in what quantities locusts could be supplied annually, what the cost of collecting them would be, and from what parts of India they could be most easily exported. Of course, all estimates can be merely approximate, and the amount of material would also vary much in different years. Messrs. Spratt say that they could easily dispose of several tons per annum.”

Dr. A. Günther’s letter was submitted to Mr. E. C. Cotes, Indian Museum, Calcutta, who communicated a note on the subject, from which the following information is taken :—

“It is unfortunate that Dr. Günther’s suggestions did not arrive three years ago, for during the last three years India has been passing through a period of invasion by the locust *Acridium peregrinum*, Oliv., which is practically at an end, and large quantities of locusts, therefore, are no longer available.

“Dr. Günther’s inquiry as to the quantities in which dried locusts could be supplied from India annually is a difficult question to answer, for in years of locust invasion hundreds or even thousands of tons might easily be procured, while in other years great difficulty would probably be experienced in collecting even a few maunds.* The fact that at the height of the past invasion six hundred maunds of locusts were killed in one day in the Kohat station alone, while in the early part of the year 1891 twenty thousand maunds were reported as destroyed in the Jhang district, shows that the quantity available was practically unlimited.

“It is only occasionally that *Acridium peregrinum* is likely to be present in such large numbers as to offer no difficulty in collecting a large supply.

* A maund = 82 lbs.

Besides this species, however, there are a large number of other *Acrididæ* in India, which occasionally multiply to such an extent as to offer the quantity required. Amongst these I might specially refer to the species *Acridium succinctum*, which invaded the Bombay Deccan in vast numbers in the year 1882-83. Forty-five tons were reported as destroyed in the Nasik Collectorate, and one hundred and eighty tons in the Satara Collectorate. As the demand is for several tons per annum, I may pass over minor local invasions, for probably it will be found best either to store the locusts, when they are available in large quantities, for use in years when they are scarce, or else to depend on other parts of the world for a supply in years when large quantities are not forthcoming in India. Either of these courses would be likely to be cheaper than attempting to collect in India in years other than those of general invasion. Locusts preserved in salt are said to be a favourite food of the Arabs in Northern Africa for taking upon long journeys, and, if salt is unsuitable for the birds which it is proposed to feed with the locusts, there could be but little difficulty in tinning any quantity of dried locusts in such a way as to ensure their keeping indefinitely without any salt.

"In years of widespread invasion it has long been the custom for the people themselves to collect the young locusts wholesale, to save their crops, and as they do this for their own interest, while no subsequent use is made of the locust—for I may pass over as insignificant what are preserved by Mahomedans and others for food—the locusts should be available at very little cost. In the case of the invasion of the Kohat station one rupee per maund was paid for the locusts at the weighing stations that were instituted by the officials with a view of encouraging the people to rid themselves of the pest. This rate would probably be a sufficient inducement to the cultivators to sell what they had collected in their fields. After they had been collected, the locusts would require to be thoroughly desiccated, to prevent putrefaction, which occurs very rapidly in India. From an experiment made in weighing a freshly-killed specimen of the Calcutta species *Tryxalis turrita*, Linn., against a thoroughly-desiccated specimen of equal size of the same species, I conclude that the weight of the insect when desiccated would be about a quarter or a fifth of what it weighed when freshly killed. If this proportion holds for *Acridium peregrinum*, some five maunds of freshly-killed locusts would be required to produce one maund of the dried article. Five rupees might be given as the probable expense of buying a maund of the raw material from the cultivators. To this must be added—(1) commission to the agents who are employed in buying the insects in the districts; (2) the cost of desiccation; and (3) the cost of carriage to the port and afterwards of shipment to England. With regard to item No. (1), it is almost impossible to furnish an estimate, as the service would be required

at such irregular intervals and the quantity of locusts to be purchased so small. With regard to No. (2), the locusts would probably only require to be spread in the first instance for a few days in the sun to dry, with a few coolies in attendance to keep off ants and birds. More complete desiccation could be arranged at the port of shipment, where ovens could easily be erected or hired for the purpose. With regard to the cost of carriage, from thirty to fifty shillings per ton would probably cover the freight to England, while the carriage by rail would probably be an equally trifling matter.

“The chief source of supply would undoubtedly be *Acridium peregrinum*. This insect breeds permanently in the sand-hills of Western Rajputana, and the area most subject to its invasion includes in India the whole of Sind, the Punjab, and Rajputana. Karachi and Bombay would therefore probably be the best ports from which to export the locusts, which could be brought down by the Sind section of the North-Western Railway and the Bombay-Baroda line, respectively.

“It may be worth while to add that, though the invasion of *Acridium peregrinum* has ceased for the present in India, Northern Africa, which was badly invaded last year by the same insect, is still said to be infested, so might offer a favourable ground for experiment.”

(The above appeared in the *Agricultural Ledger*, 1893, No. 2.)

WILD DOGS.

As I was walking along a game-track in the Nullamallais, I came upon a dog stretched at length across the path. Instead of bolting away—as wild dogs usually do at sight of man—the dog rose up reluctantly and slouched in a semi-circle, eyeing me with a sinister look. I had sent my guns round by the road to meet me at a point further on, and was therefore unarmed. The dog at length disappeared behind a bush, and I walked on marvelling at its strange behaviour. I had gone thus about a furlong when I happened to look behind and I saw the dog rushing after me at full speed, with its nose to the ground (this was strange, as it had already seen me). I immediately faced round, with a large stone I hastily picked from the ground. The dog rushed almost to my feet (still with its nose to the ground and not looking up!) and I hit it a severe blow with the stone, at the same time rushing to meet it with a loud shout. The shout appeared to alarm the dog more than the missile. It started aside and again semi-circled, while I retreated backwards—keeping my face to the dog—in the direction I had come. I did this, as I should have got into thicker jungle had I gone on. I felt convinced that the dog would again attack me there, and perhaps fetch other dogs to its assistance. In this way I backed out of the jungle back to my tent. It was fortunate for me that this dog was alone. Had others been with it, its aggressive demeanour would probably have incited them to an attack. I was much annoyed at having been turned back by a cur of a dog, and sent post-haste for a gun to revenge the indignity. As soon as this arrived, I stealthily paraded the path again, hoping to find the dog again, but it was nowhere to be seen. I then remembered that I had observed it to be a slut, with dugs nearly touching the ground. Recollecting this, I determined to search the forest, and, after nearly two hours' patient investigation, I came upon a cave concealed in the undergrowth. A faint whine from its depths apprised me that I had found the puppies, and I hastened back to my camp for coolies to dig them out. I soon unearthed six lovely little russet-red balls of fur (the mother was evidently out foraging as we did not see any sign of her). Anything prettier than the puppies it would be difficult to imagine; but their beauty was marred by a pungent smell, such as is found about the cages of the *feræ naturæ* in a zoo. This odour caused prodigious excitement in my camp when I arrived there with my captives. My dog rushed forward barking furiously, with all its hairs on end, and even the goats made fierce demonstrations of hostility. I sent the puppies away to my bungalow at once. During the night the mother evidently traced them to my tent, for she came around the camp, and the servants were throwing fire-sticks at her all night to keep her off. In the morning I still

found her circling round and might easily have shot her ; but I sympathised with the faithful brute in her bereavement, and would not harm her.

I struck camp and hastened to my bungalow in order to make due provision for rearing the puppies. I made them over to a friend, who was living with me, to rear. He got a pie from the village with a family of five puppies. He mixed the jungle puppies with these ; but the old pie was so horrified at their odour that she would have none of them. He was more successful with a second pie who possessed three pups of her own. She also manifested great repugnance at first ; but after a great deal of trouble this was overcome and in time she became as attached to the jungle puppies as to her own. This was no doubt due to the fact that, in the course of a week or so, her own puppies had got to smell as badly as their jungle *confrères*. At a very early age the jungle puppies evinced an incorrigibly pugnacious disposition, and fought with appalling ferocity. It was incredible to see such small young things fighting with so much resolution and tenacity. If the uppermost belligerent were lifted by the tail to the height of one's head, it would carry its opponent up with it, and the latter likewise would decline to relinquish its hold. They would fight in this way day after day, the sluts being quite as pugnacious as the dog-puppies. The unfortunate pie-pups must have wondered into what company they had fallen. They would yelp piteously when their wild foster-brethren shook them up, and we were obliged to send them away, when still quite small, to prevent them from being killed. Meantime the wild pups continued to fight with each other with unabated ferocity until they were about seven or eight months old, when—most singular to relate—they put a permanent period to their hostilities and lived in perfect amity. Apparently they had by this time decided which was the strongest amongst them, as they paid noticeable deference to one large dog—the largest amongst them—who acted as their leader. They never fought with each other after they became adults. The big dog above referred to had a white spot on the near forepaw, and the extreme end of his tail was tipped with white. This was only observable on a close and critical scrutiny. Two other dogs were similarly marked ; the remaining three were entirely russet-red. They all had large prick ears (which they laid back flat, like a vicious horse when angry or attacking) and long heavy bushy tails. They would eat nothing but raw meat. We nearly starved them to death in the endeavour to make them eat cooked food, but without avail. They would eat nothing but flesh—and not that unless it was raw. A monkey they relished most. When one would be thrown to them, they would eat the flesh out most artistically, leaving the skin like a shell. They would not eat stale meat, and this confirmed a fact I had previously noticed in the forests, that wild dogs never return to a kill after having made one meal from it. I have frequently come across the carcasses of sambar in the forest, killed by wild dogs, with only a small portion consumed and the rest rotting to waste. The dogs were dangerous to approach when feeding ; but could be handled at any other time.

They would never molest men ; but would "go" for any or every animal. In consequence they had always to be kept on the chain. When they broke loose—which not infrequently happened—they did not attempt to escape, but always kept about the house. They all met with untimely deaths. One died when still a pup, from confinement in a basket—they appear to require plenty of fresh air—another while *en route* to a railway station, and the remaining four from diarrhoea engendered by a cannibal propensity they had of killing and eating any stray dog they could get hold of.

My observation of these dogs has convinced me that for gameness, staunchness, and invincible tenacity we have no breed of domestic dog to compare with the wild one. Sportsmen scoff at the native belief that wild dogs drive away and even kill tigers. I was a derisive sceptic in reference to this belief myself once ; but of late years events have come under my notice which incline me to think that the natives may be right after all. *Prima facie* it does appear preposterous to allege that a mighty muscular animal like a tiger, the merest pat of whose paw is sufficient to crush the life out of the wild dog, is liable to fall a victim to so comparatively puny an assailant even when indefinitely multiplied ; but the secret of the success of the wild dogs may lie in the lightning-like celerity with which they attack, combined with the marvellous tenacity of their hold, and their invincible resolution never to be shaken off once they seize. *Reis kukul !* (wild dogs) said a *Chenchu* succinctly to me one day, as we surveyed the carcass of a fine stag sambar in the depths of a forest in the Nullamallais. These laconic words explained everything—the torn ears and gorged eyes of the sambar ; the splashes of blood we saw on the hill-sides for some miles ; and the disturbed state of the ground and undergrowth at intervals of every furlong or so, where the stag had repeatedly fallen to the earth in his headlong flight, borne down under the weight of his relentless enemies, clinging to his ears and eyes with an invincible tenacity that no effort of the hunted beast could overcome. It was difficult to realise that the great, powerful, fleet beast lying dead before us, with his enormous and formidable antlers, had been vanquished both in speed and strength by so small an antagonist as a wild dog. As if to show us how it was done, our meditations were interrupted by piercing woman-like screams, and a splendid stag rushed distractedly past us with a wild dog clinging to his back ; the sambar was screaming piteously, and vainly trying to dislodge the dog by backward sweeps of his antlers, while in the rear laboured three other wild dogs. This order they maintained until the descent of the hill, when the stag made a false step, and rolled over and over with a force apparently sufficient to smash the wild dog to a jelly, but which had not the slightest effect on the beast inasmuch as it did not relinquish its hold ! As the stag regained his feet the foremost of the three pursuing wild dogs sprang for its head and was swept aside by a vigorous stroke of the stag's antlers ; but at the same moment, ere the stag could lower his head again, the other two dogs seized

him, one by the left eye and the other by the right ear. It was all up with the stag now, and he ran in circles, and from side to side, trying to shake off the dogs, falling repeatedly, and screaming dolefully the whole time. When we overtook the hunt, the stag was lying dead, and the wild dogs slunk off at our approach. I found the left eye of the stag torn out, and the right ear torn off. It is simply marvellous how the wild dog managed to cling to the eye; but the *Chenchus* affirm that wild dogs always seize their game by the eyes, if possible. In this case, the wild dog we saw on the stag's back must have surprised the animal when it was lying down.

It is significant that all the jungle tribes of India—scattered all over the Peninsula, who hold no communication with each other—positively affirm that the wild dogs attack and overcome tigers. I have heard the tale from the *Kaders* of the Annamallais, the *Kurumbers* of the Wynaad, the *Khonds* of the Ganjam Maliahs, and the *Chenchus* of the Nullamallais. I treated it at first with orthodox contempt. My scepticism, however, was shaken when I saw a *Chenchu* woman, who had been out in the forest picking *mowhra* flowers, rush into the *Chenchu* settlement, where I was encamped, and incoherently relate to her tribes-people how she had just seen a tiger in full flight pursued by a large pack of wild dogs. It was evident that the *Chenchus* fully believed their country-woman's story, for they immediately abandoned their avocations and set out to bring in the tiger's body, in the confident assurance that the dogs would overtake and kill it. They did not return until the night-fall, when they informed me they had tracked the pugs of the fugitive tiger and the pursuing dogs to a point where the thickness of the jungle had enabled "stripes" to give his enemies the slip. They demurred to the suggestion I made that the tiger may have beaten the dogs off, and pointed out that in that case one or more dogs would have been killed, whose carcases they could not fail to have found. No one who saw the woman when she rushed in with her news could doubt the fact that she spoke the truth, and this convinced me that tigers at least fly from wild dogs on occasion. Subsequently I was afforded, if not positive, at least pretty convincing proof that this is not only the case, but that tigers are actually killed by wild dogs. I had wounded a tiger, and a fortnight afterwards heard that a tiger had been found dead in the forest at least fifteen miles from the spot where I had inflicted the wound. I at once concluded that the tiger must be the one I had wounded, and, repairing to the spot, took from the people who found the animal the skin, skull and claws, and gave them a present for their discovery. They, however, surrendered the tiger's spoils very reluctantly, vehemently maintaining that it had been killed by wild dogs. I rejoined that, if this was the case, the dogs could only have killed the tiger in consequence of the wound I had inflicted on the latter, which rendered it unequal to beating them off. The very next week, however, another tiger was found dead, and some days afterwards, a third one! Now, I am persuaded that these last two tigers—if not the whole three—must have been killed by wild dogs, as the *Chenchus*

who found them affirmed, as no one but myself was shooting in the forest at the time, and I had drawn a bead only on one tiger. Unfortunately, the last two tigers were in a state of utter decomposition when found, so it was not possible to see if the carcasses bore the marks of bullets. I did not see the carcasses myself, as I had shifted my camp, but the skulls and claws of the tigers were brought to me.

The *Chenchus* possess the largest breed of buffaloes in India, and probably therefore in the world. These buffaloes are semi-wild and extremely fierce, and graze out all night in the forest. There are certain forest fruits of which they are inordinately fond, and when these are in season the buffaloes will stand under the trees all night and eat the ripe fruit as it drops to the ground. I may add parenthetically that there is a forest fruit of the shape and size of a wood-apple, with a very powerful, pungent, aromatic smell, which tigers and wild dogs eat greedily; this is also the favourite fruit of the *Chenchu* buffalo; but singularly enough the bear, which devours every other kind of forest fruit, will not touch it. The favourite fruit of bears and wild dogs alike is that of the female blackwood tree. It is a great mistake, therefore, to assume that carnivorous animals, and above all the *feræ naturæ*, will not eat fruit. Tigers also eat salt-earth, and on occasion they will even eat a piece of cowdung! The jackal is a promiscuous fruit-eater, and in particular affects the wild Brazil cherries which abound on the Nilgiris. To return, however, to the *Chenchu* buffaloes. The pugs of tigers on the forest paths in the morning showed that tigers passed almost nightly through their very midst, not only without molesting the buffaloes, but without even frightening them home; the buffaloes maintained their ground notwithstanding the presence of the tigers of which they must have been aware. On the other hand, I have known the same buffaloes to be driven in at night by a pack of wild dogs. Only on three occasions have I known these buffaloes to be killed by tigers. On two occasions, the buffaloes were surprised away from the herd and killed without difficulty, as far as I could see (each time by a single tiger); on the third occasion, the tiger was assailed by the whole herd of the buffaloes and killed.

The Bairnuti Forest Inspection Shed is situated in the midst of a vast jungle. I was sitting in the verandah about five o'clock one beautiful evening, reading the *Pioneer*, and ever and anon glancing at a herd of buffaloes which were feeding on the fallen fruit of a large fig tree which strewed the ground on the skirt of the forest, about a stone's throw from where I was seated. The fig tree afforded an æsthetic sight, with great masses of ripe golden and crimson-hued fruit gleaming through its emerald-green foliage; the thud of the rapidly-falling fruit as they struck the ground was diversified by the shrill screams of innumerable pea-fowl, and the belligerent crowing of rival jungle cocks. It was a scene to delight the heart of a sportsman, and I enjoyed it to the full. "Tonk," belled a sambar in startled alarm, apparently

from the midst of the greedily-feeding buffaloes. "Tonk," reverberated another, a little further in the forests; and then a perfect chorus of "Tonk" rang out from different parts. I sprang for my rifle, for I knew well what this portended—either a tiger or wild dogs were afoot, most probably the former. I had scarcely regained the verandah with my rifle when a most awful combined roaring and bellowing issued from the forest, and I knew at once that "stripes" and the buffaloes were engaged. Not all the buffaloes however, for with dismayed snorts a number rushed back to the shed, as if in a headlong flight that nothing could stop. Suddenly, however, they stopped as if by word of command and, as though ashamed of their momentary panic, they circled round and returned to the scene of conflict. I never saw anything more magnificent than their steady resolute advance. In serried ranks, like a squadron of cavalry, with their great heads lowered to the ground, and bellowing out encouragement to their fellows fighting in the forest, they swept onwards to the rescue, while I nimbly ran along in their rear with my rifle. In this order we crashed into the forest. A feeble gurgling noise announced that the buffalo had been vanquished, and a hoarse roar of rage proclaimed that "stripes" refused to quit his victim, despite the formidable array of horned heads which now bore down upon him or rather "her" as she proved to be a tigress. Then ensued a perfect pandemonium of roaring, bellowing, stamping and crushing, in the midst of which I was obliged to drop my rifle and shin up the nearest tree, owing to two blundering buffaloes, who could not force their way through their struggling companions in front, fixing their regards upon me and, in the insane delusion that I was the cause of all the turmoil, charging me savagely. Were it not for the fact that I am long-limbed and as active as a *Chenchu*, those buffaloes would have flattened out my carcase like a pancake. It was very annoying to be treed and thus to lose sight of what was going on; but, after what appeared an interminable time, a number of *Chenchus* arrived on the scene, attracted by the row. Even they had the greatest difficulty to appease the ferocious buffaloes and get them away. But at last they succeeded in doing this, and with cocked rifle and finger on trigger, I advanced to see how "stripes" had fared. The undergrowth was trampled down all round, and I had no difficulty in finding the tiger trampled deep into the mud and gored all over. Beside it lay the carcase of an immense she-buffalo, and a yard or two further away the body of her calf. This explained everything; the tiger had crept up and seized the calf; the mother had immediately assailed "stripes" in defence of her offspring, but had been overcome, and dramatic justice had been finally executed on the marauder by the united members of the herd, notwithstanding that in the momentary panic of the tiger's onset they had, at first, run away.

ROBIN HOOD.

(The above appeared in the *Pioneer*.)

ELEPHANT-CAPTURING OPERATIONS ON THE ANAIMALAI HILLS.

From the "Forester," January 1895.

Elephant-capturing operations by the pit-fall system were set in working order in the locality of the forest station at Mountstuart on the Anaimalai Hills by Mr. H. J. Porter, Deputy Conservator of Forests, in the season of 1890. For the past five years, therefore, during each of the working seasons, which commence in June and end in December, elephant-captures have been attempted, and it may interest some readers of the *Indian Forester* to know the results of the operations and the experience gained. Places were selected in the known runs of the elephants, and the pits were dug in groups of three.



To commence with, about 21 pits were dug in different parts, all however being within a two-mile radius of the Mountstuart Forest station. Since 1890, some 20 pits more have been dug out. The dimensions of the original pits were 12 ft. \times 9 ft. with a depth of 10 ft. These are too large, and a pit 10 ft. \times 10 ft. \times 10 ft. is amply big enough. The sides of the pits were made vertical and not sloping downwards as are the pits in Malabar under Mr. Hadfield; and some two or three feet of brushwood were placed in the bottom of each to act as bedding to break the fall of the animal. The pits were then covered by means of bamboos placed across them, and on these were spread grass, leaves, etc. The pits are visited every morning by a Forest guard or watcher deputed for the purpose, and these report to their superior officers whenever a fall takes place. The Range officer in charge or the D.F.O. himself should, however, inspect the pits as often as possible, and at least once in a week, to see that the guard and watcher are not humbugging. During the first year, one animal, to which the name of Juno was given, was captured. This subsequently died. In the second year—1891—four animals were captured, two of which subsequently died, and two of which are now living. In the third year—1892—two extraordinary falls took place by which seven animals were captured in five pits. I reported this to the *Indian Forester* at the time of capture, 1st September, 1892. Out of these seven animals, four are still living. During 1893 two animals were captured, and during the present year—1894—four animals have been caught, all of

which are living. I append the following statement giving the names, sex and height of the animals captured and whether living or not :—

List of Elephants captured up to September 30th, 1894.

Serial Number.	Name of Elephant.	Date of Capture.	Male or Female.	Height	REMARKS.
1	Juno	1890-91	Cow	...	Died (exact date of capture and death not known).
2	Maude	23rd July 1891.	Cow	4½'	Sold on 20th July, 1892, for Rs. 300.
3	Ada	24th July 1891.	Cow	5'	Died on 14th February, 1892.
4	Abdul	4th Oct. 1891.	Tusker	6½'	Still living.
5	Elsie	23rd Sept. 1892.	Cow	5½'	Died in June, 1893.
6	Alice	Do.	Cow	4½'	Transferred to S. Malabar in Dec., 1893.
7	Ranger	Do.	Male	4½'	Died in June, 1893.
8	Cerise	Do.	Cow	7½'	Died on 1st October, 1892, from an injury sustained in the face.
9	Phyllis II.	25th Sept. 1892.	Cow	7'	Still living. } These two were captured in the same pit at the same time as were Ranger and Cerise.
10	Jumbo II.	Do.	Tusker	6'	Do. }
11	Pragasam	Do.	Cow	4½'	Transferred to S. Malabar, Dec., 1893.
12	Ranger	23rd July 1893.	Tusker	7½'	Still living.
13	Cerise	20th Oct. 1893.	Cow	5'	Do.
14	Forester	10th Aug. 1894.	Tusker	7½'	Do.
15	Elsie	18th Aug. 1894.	Cow	8'	Do.
16	Penelope	18th Aug. 1894.	Cow	8'	Do.
17	Ganesh	4th Sept. 1894.	Male	4½'	Do.

It will be seen from the above statement that out of a total of 17 captures 12 are now living. It may be remarked, moreover, that the casualties took place amongst the first three years' captures when the attendants, who are local hillmen, called Mulcers, were entirely inexperienced concerning elephants. During the last two years, I have increased the bed of brushwood considerably, and made it a rule to have the bed reach to within 4 feet of the

top of the pit. The results speak for themselves ; not a single animal has since been injured in the face, although two of the latest captures are the largest animals caught since operations were commenced.

The removal of a capture to the kraals, which are within two or three miles from the pits, is a very simple matter, provided everything is in readiness beforehand. The size of the animal's neck is estimated and a peg is put in the rope so as to prevent the noose going smaller than the neck-size as estimated. This noose is then thrown over the elephant's neck and pulled tight to the peg, the end of the rope being bound round a neighbouring tree ; next, one of the elephant's hind legs is noosed, and the end of this rope, too, is for the time being, bound round a neighbouring tree. The neck rope at the peg then has to be tied with twine or fibre to prevent the noose being loosened by the elephant. This operation is, taking it all round, the most risky one connected with the capture. But if proper care is taken there is nothing to fear.

The pit is then filled up by means of billets of wood being thrown in, and as the animal rises nearer the surface of the ground, the two ropes fastening him are pulled tighter around the trees. Eventually he gets out of the pit somewhat fatigued ; the ropes which secure him are then fastened to two tame elephants and the animals are marched in single file (the captured one being, of course, in the middle) to the kraal and all the ropes are removed. He is watered three times a day and soon made tame by kindness, given sugarcane, etc. Somewhat large animals are generally in the kraal 3 months before they can be taken out ; the little ones of 4 ft. or $5\frac{1}{2}$ feet high, however, I have removed within 3 weeks of capture.

The work of capturing elephants is an exceedingly interesting one, and only needs care and constant supervision to render it successful ; and certainly the more one has to do with these animals the more one is bound to recognise what intelligent useful beasts they are. Having left the South Coimbatore District, I regret much that, for some time at least, I shall have no connection with this kind of work entrusted to forest officers.

H. B. BRYANT.

PALAMCOTTAH,

Tinnevely Division.

THE FRUIT CULTURE ON THE HIMALAYA.

The experience obtained in regard to fruit cultivation on the hills has now reached a stage at which it deserves to be brought under attention for the benefit of those who may be tempted to take up the pursuit as a means of livelihood. The industry is still in its infancy, but it undoubtedly possesses great capabilities for future development, and if carried out under proper management should prove to be a source of much profit. The demand for English fruit in India is far in excess of what can now be supplied, and it would take many years for fruit-growers in this country to experience the disadvantages which growers in England have to contend with in the low prices offered during seasons of plenty. The most important considerations in all attempts to grow fruit successfully on the Himalaya are—firstly a suitable climate, and secondly an accessible market. Unfortunately it is not easy to find localities where both of these conditions are combined; for as a rule the best fruit-growing districts are situated too far away from any market of sufficient importance, and fruit-growers in these parts are at present much handicapped by the difficulties and expense of transport. This obstacle may in time become lessened as communications are improved. In order to expedite the despatch of portable fruit, it might be possible in some cases to adopt wire carriage in the same manner as railway sleepers are brought down from the leased forests of Tehri-Garhwal. The principal markets for Himalayan fruit are, of course, the various hill stations, which are situated for the most part on the outermost ranges. At some of those hill stations there are Government fruit nurseries, and a considerable quantity of fruit is raised by private enterprise. But the climate of the outer ranges is too uncertain; favourable seasons may occur occasionally, but in the long run fruit-growing there is found to be too precarious an occupation to be depended upon as a means of livelihood. Thanks to Mr. Coldstream, lately Deputy Commissioner of Simla, we are now in possession of some extremely valuable facts regarding fruit culture in Kulu and in the neighbourhood of Simla. Mr. Coldstream has for several years taken much practical interest in the subject, and he has now put together in printed form some very useful information, consisting of notes contributed by a few of the most experienced growers in Kulu and elsewhere in the Punjab. The results, as far as they go, are decidedly encouraging.

A great variety of fruit can be grown in Kulu owing to differences in elevation. Apples, pears, plums and cherries succeed best at the higher altitudes, *i.e.*, at or above 6,500 ft.; at about one thousand feet lower is the proper elevation for apricots and peaches, whilst oranges, grapes and figs can be grown to best advantage between 3,000 and 4,500 ft. above the sea. Apples and pears are grown to great perfection in Kulu. Consignments of these fruits are occasionally received in Simla during the autumn months, and many

persons there can testify to their excellent quality. Captain Lee says that most of the varieties of English and American apples that he has tried have succeeded at Bundrole (5,000 ft.). Captain Banon, writing from Manauli, the elevation of which is 6,400 ft. says :—“ All the English varieties I have yet experimented with have answered admirably. They seem to improve as regards flavour, size, and colour, and usually ripen a month earlier than in England. . . . Some English apples, as for instance Cox's Orange Pippin, which is considered the most delicious apple in England, the soil and climate of this place seem to suit perfectly ; and if one grew apples simply for profit one should grow nothing but this sort for the Simla market.” Mr. Donald of Dobi reports very favourably of the apple trees in his garden, the elevation of which is about 4,000 ft. only above the sea. Buds from English varieties were put on to indigenous trees, and the stocks being large, the trees fruited after four years, and have ever since borne heavy crops every alternate year. Pears do well to Manauli, but not as well as apples. Captain Banon says that the indigenous medlar pear called *shegal* (*Pyrus pashia*), and which is abundant in Kulu, “ answers admirably as stock for English pear, medlars, and quinces. If anything, this place is a little too cold for pears in some years. Louise Bonne of Jersey is the most profitable pear to grow here for market, though Marie Louise and William's Bon Chrétien also grow well and with a superior flavour to the fruit grown in England.” Mr. Donald of Dobi says that pears budded on the quince stock are the most prolific and can stand more moisture.

That the apricot grows abundantly all over the hills everyone knows : it might, in fact, be called the potato of the Himalayas, but the ordinary kind would not attract the palate of a gourmand. Mr. Carleton's experiments with Kashmir apricots at Ani, a village in Kulu at 3,500 ft., have proved a remarkable success. He says—“ The native apricot in this warm valley was not prolific, and from analogy, we concluded that the place was too warm for the Kashmir or English variety. We, however, introduced 10 trees from the Government Garden at Lahore. They grew very vigorously and began to bear fruit the fourth year. They are even more prolific than the native variety in the Kulu valley. The fruit ripens about the 15th or 20th of June. I should advise the extensive cultivation of the Kashmir and English apricot in all the lower hills. The successful introduction of the famous Kashmir-American fruit drying machines into Simla would enable enterprising persons to establish a very profitable industry in preparing dried apricots for the Indian markets.” Captain Banon notices this important difficulty in regard to the cultivation of the apricot. “ For several years past,” he writes, “ I have noticed that the first ripe apricot and the monsoon rains arrive together on the same day. The effect of the rain is to wash all the flavour out of the apricot, cause the fruit to split open, and prevent its ripening properly. Sometimes, after the first burst of the monsoon, we get ten days or a fortnight's fine

weather, when the apricot ripens perfectly and is not wanting in flavour. I agree with the Revd. Mr. Carleton in thinking that good varieties of the Kashmir, and perhaps English, apricots might be introduced into the villages."

Mr. Coldstream, in an editorial note of his report, says :—" Peaches of excellent quality have been grown by Mr. Carleton at Ani in Kulu, from peach stones imported from America without grafting. American peach stones have been imported in considerable quantity and distributed in the Simla District and elsewhere. Inquiry was made of Mr. Carleton in August, 1893, regarding some remarkably fine peaches sent by him to Simla." Mr. Carleton replied :—" Nine years ago we received from Philadelphia some peach stones taken from a variety of very choice peaches. We planted them here and nearly all germinated ; with one exception, they were all transplanted to a rocky and rather poor soil ; one was left in a rich soil where it germinated, and has never had any cultivation whatever and is now double the size of the others that were transplanted to a poor soil. All these have been mulched and highly cultivated, but still remain somewhat stunted ; all bear the finest fruit. Some of the peaches have measured more than 10 inches in circumference ; most of them are superior to the fruit of the grafted trees sent from America. They began to fruit when four years old." The common plum of the hills, usually known as " Aru Bokhara," is abundant in Kulu, and does very well, Capt. Banon says, as stock for English plums, which thrive well and bear early and heavy crops. He also states that cooking-plums improve so much in flavour and sweetness that they become in reality dessert plums. Captain Lee also reports favourably on plum cultivation at Bundrole. As to cherries, Captain Banon says :—" All kinds of English cherries, red, black, and white hearts, ripen well here ; but, if anything, the climate is a little too warm for them. They ripen, as a general rule, early in June, and are the first fruit to come into the market. They would not be very profitable to grow as they do not bear carriage well. If the Post Office were to halve their rates for the parcel post, a good trade might be done with the more perishable fruit ; but at present few people can afford to pay 8 annas a seer on consignments of fruit, though they would be willing enough to pay 4 annas." The wild cherry is naturalised in Kulu, and can be used as stock for English kinds. Grapes, especially the hardy American sorts, have been found to do well with some time and trouble. They would certainly be a remunerative crop. An important point with regard to vine-culture in this country is to secure early varieties which will come into bearing before the advent of the heavy monsoon rain, or late-bearing varieties which will give fruit after the rains are over.

In connection with fruit-growing, we must not omit to take account of the walnut, a tree the growing of which ought to be encouraged by every possible means, not only in Kulu, where it grows to perfection, but throughout the Himalayan Districts. Mr. Carleton observes that in former times in Kashmir, Chumba and Kulu, the only use of the fruit was the production of oil

to adulterate ghee. But now the demand for walnuts in the plains is great for those grown in Kulu. In Jaunsar, beyond Chakrata, they are also very fine, especially the thin-shelled variety. Considering how easily the fruit can be distributed to distant markets, walnut cultivation ought to prove a very profitable undertaking. The chesnut is another tree of which it is very desirable to extend the cultivation in the Himalayas, but the difficulty is to find a soil and climate where they do well. Sir Edward Buck has devoted much trouble to encouraging the growth of this tree in the neighbourhood of Simla.

Mr. Carleton's experiments with oranges in Kulu have shown that the Malta Orange can be grown successfully on the lower hills up to an elevation of 4,500 ft. "In California," he says, "orange cultivation is extending up to the rich valleys of the Pacific slopes, and I see no reason why in these lower hills, orange cultivation should not be a success. I learn that oranges sold from the Government garden in Gujranwala, and other gardens, usually fetch from 5 to 8 rupees per hundred, and it is quite certain that Maltese oranges sent to the Simla market in April, when there is little fruit for sale, would fetch Rs. 8 and perhaps Rs. 10 per hundred. An orange tree 8 years old that gives an annual crop of over 200 oranges could give the owner a profit of 16 rupees, and that only on 10 feet square of ground."

Many other kinds of fruit can be grown successfully in Kulu, such as strawberries, gooseberries, currants, raspberries, figs, &c., but they are all of too perishable a nature for safe carriage to the nearest market. There is no reason, however, why they should not be preserved either as jam or bottled fruit, and the same suggestion would apply equally to peaches, apricots and pears. The art of preserving fruit is one quite apart from that of its cultivation and requires a very different kind of experience. These two industries might, however, be undertaken by a company employing experts in each department, and such a business, if properly managed, could not fail to be a very profitable one. Instead of importing year by year enormous quantities of jams and bottled fruits, India ought in reality to become an exporter of such things. Even now, some of the jams made by natives at Simla and other hill stations are very far superior to much of what is imported from England. Excellent liqueurs can be prepared also from peaches, apricots and cherries grown on the Himalaya.

There are many other localities on the Himalaya besides Kulu where fruit culture and fruit preserves might be undertaken with profit. The most important existing fruit orchards are those at Mahasu near Simla, which were started about eleven years ago. To Mr. A. O. Hume and Sir Edward Buck their existence and continuous development are due, and they are now in a flourishing condition under the control of the Simla Municipality. These and the Government Gardens at Mussoorie and a few nurseries under the charge of the Forest Department are the only establishments where any results are

periodically made known, and very few of these reports come under the eye of the general public. Excellent fruit is grown in many private gardens in British Garhwal and Kumaon. There are Government nurseries near Rani-khet, and the fruit gardens at Julna near Almora, have long been famous for the excellent quality of the fruit produced there by Messrs. Wheeler Brothers. We have not mentioned Kashmir, which country alone might in time be made capable of supplying the whole of India with fruit. But in order to render fruit culture on the hills more attractive as an industry for private enterprise, co-operation is required, and this would undoubtedly be brought about by the existence of a journal which might be started so as to include the whole subject of fruit culture and fruit preserving, in the plains as well as on the hills. Such a periodical would serve as a continuous record of results, as well as a medium for profitable discussion. By way of summary it may be stated, firstly, that the present condition of fruit culture on the Himalaya gives promise of great future development. Secondly, that persons, either individually or as a company, desiring to take it up as an industry would not fail to find it a profitable undertaking by combining with that business the manufacture of jams and other preparations of preserved fruit. Thirdly, that in order to excite interest in the subject, and to induce competent persons to take up the industry as a means of livelihood, the starting of a periodical journal is a desideratum.—(*Pioneer*.)

CONCERNING FLEAS.

The flea shares with the cockroach the doubtful honour of being almost as common as the dirt in which both live ; but whereas the cockroach is useful as a scavenger, the flea is harboured by the dirt at certain periods of its life-history, which was carefully worked out, nearly two centuries ago, by an Italian, D'Jacenti Centone, whose observations are contained in a letter to Martin Lister, published in the *Philosophical Transactions* for 1699, accompanied by a plate of well-drawn figures of the flea, its eggs, the larva and cocoons.

No one requires to be told of the general external anatomy of the flea. We all know its abominable bilateral flatness, which makes it impossible to kill it by pressure between the fingers. Every one, too, is acquainted with its wonderful agility and strength, as expressed in the great leaps it takes when chased. The leap has been measured, and it is found to be some two hundred times the length of the insect, which is equivalent to a man leaping three or four hundred times his own height. Ere this fact was scientifically known, Aristophanes had held Socrates up to ridicule in attributing to him the endeavour to measure this leap of the flea.

The great sensitiveness to danger, the apprehension of being chased, is due in great part to the sensory hairs which are set in rows across the flea's back ; some of these hairs are much stronger than others, and these rows of bristles, having different positions in different species, are of considerable value for identification.

If the head of a flea be examined from the side, the mouth organs depending from its under-surface are seen to consist of two pairs of jointed sensory appendages (the maxillary palps and the labial palps), by means of which the animal can select dainty spots wherein to thrust its stylet-like mandibles. These latter organs lie side by side in an incomplete tube formed by the approximation of the two labial palps ; between the mandibles lies a median piercer—the hypo-pharynx—which is traversed by the duct of the salivary glands ; these probably discharged some irritant into the puncture.

The flea lays some eight or ten eggs at a time ; these, in the case of the dog or cat, are deposited among the fur ; in man in the undergarments ; but in most cases the eggs, sooner or later, fall to the ground, and here undergo development. Each egg is oval, and measures about 0·6 mm. in length. From it there soon issues a white footless grub or larva, which breaks through the egg shell by means of a "shell piercer" on its head analogous to that on the tip of the beak of a young chick. This worm-like larva consists of a yellow head followed by twelve white segments, each provided with long sensory hairs at the sides ; the large terminal segment carries a couple of stiff spines by means of which, no doubt, locomotion is in part effected. The head carries a couple of strong mandibles, by means of which the larva, which wriggles about actively, feeds on decaying vegetable and animal refuse. This stage

lasts about twelve days in summer, rather longer in winter, and then the grub spins round itself a silken cocoon, like that of the silkworm, and enters upon a state of rest. Within this cocoon the larva changes into an inactive pupa. Under the larval skin profound changes are taking place, and the organs of the flea itself become developed, the legs, head appendages, and so on make their appearance, but each is wrapped in a separate case of skin. This inactive pupal stage lasts from ten to sixteen days, or may even, in cold climates, continue through the winter; then the flea emerges from the pupa, bursting through the pupal skin and, issuing from the cocoon, commences its predatory life on warm-blooded animals.

Thus the life-history occupies rather less than a month, more or less, according to temperature and surroundings. If there is no dust about on which the larva can feed, it dies. There is no need to insist here on the fact that cleanliness is a powerful enemy to the flea.¹

The number of species of flea occurring in Great Britain can be stated only with some reserve, but at least fourteen have been accurately distinguished by German authorities, though only two of these at the most are predatory on man. The common flea, which occurs on man, is *Pulex irritans*; this is almost cosmopolitan, though it is doubtful if it occurs in Equatorial regions. Man is, however, stated to be subject to occasional attacks from the flea, naturally living on the blood of the dog and cat, and known as *P. serraticeps*. It is uncertain whether this species actually bites man. Some authors, even at the present day, refer to the dog's flea, as *P. canis*, to the cat's flea, as *P. felis*, &c., but Saschenberg (1880) has shown that the fleas infesting the dog, cat and many wild carnivora in reality belong to one species. The two fleas, *P. irritans* and *P. serraticeps*, are much of a size, measuring from 2 to 3 millimeters in length; the thorax of the human flea is, however, larger than that of the carnivore's flea, and the latter derives its name from the presence of two rows of stiff hairs or bristles—one round the head and the other on the thorax.

Fowls, pigeons, ducks, and, with few exceptions (for the parrot and woodpecker have each their own particular flea), the parasite of all birds is a third species, *P. avium*. It is slenderer and longer (3 to 3·5 mm.) than the two preceding species. It possesses the thoracic bristles of the carnivore's flea, but it is without the head spines; and further, the antennæ, which are inconspicuous in the two preceding species, are here large and projecting.

A fourth species (*P. gonioccephalus*), smaller than the dog's flea, but rather like it, is found on the rabbit and hare. The squirrel, badger, and hedgehog each has its own species.

¹ Even as early as 1687 Leuwenhock, who made such excellent and surprising use of the earliest microscopes, had published some facts of the flea's history.

Kirby and Spence tell us that Hungarian shepherds were in the habit of greasing their clothes and their person with hog's lard, and thereby "rendering themselves disgusting even to fleas."

Three or four species of flea occur on bats, and belong to a different genus (*Typhlopsylla*), in which the eyes are absent or quite small; the body is relatively longer, as the abdomen is not so deep from above downwards. Mice rats and shrews are attacked by three other species of this same genus.

A third genus is found for the mole's flea (*Hystriopsylla obtusiceps*) which is the largest of our native fleas, measuring 3·5 mm. to 5·5 mm. The body is particularly hairy, the head is short and rounded, and like the preceding genus is without eyes. This flea is also found in the nests of bumble bees, where no doubt it is a harmless visitor, having left the mole during the latter's excursion through the soil.²

It appears then that certain species of flea are associated, not with species of mammals, but with larger groups.

It is a curious and interesting fact, as far as we are aware, no flea has been recorded as occurring in monkeys in a state of nature. Judging from their actions in captivity, one would assume the presence of these parasites in considerable numbers. A well-known naturalist informs us that he kept a monkey for three years and never found a flea on it. Nevertheless, nothing seemed to amuse the monkey better than for its owner to pretend to catch fleas on its coat and to present them to it to be eaten. Man, therefore, does not seem to have inherited fleas from his Simian ancestors; it appears probable that he had "caught" fleas from his associates, the cat and the dog, and that the present human flea, *P. irritans*, is descended from the same ancestor as *P. serraticeps*.

The flea is really only an occasional parasite, merely visiting its host to obtain food in the same kind of way that the leech merely sucks the blood of man and then drops off. The flea and the leech belong to quite a different category of parasites from the tape-worm or the tick, which take up their position once and for all. In fact, the flea makes use of men and other animals merely as a larder or provision store, and leaves its host readily. The character of the blood and the thickness of the skin no doubt determines that one species of flea attacks man, another the dog, and so on. On the death of its host the fleas leave at once.

The flea is fairly long lived for an insect. We have a record of one which lived for 23 months in captivity, when it died of old age.

(*The above appeared in the British Medical Journal on 5th January, 1895.*)

² No doubt the other species of fleas, such as those which have been recorded from the fox, weasel, stoat, and other animals, as occurring in Germany, Holland, may be added to our list of British forms.

MISCELLANEOUS NOTES.

No. I.—CROCODILES IN ARTIFICIAL RESERVOIRS.

During April last, rewards were paid by the Bombay Municipality to the three peons employed in guarding Vehar and Tulsi Lakes for the production of ninety-one crocodiles' eggs found on the borders of Tulsi and for the two crocodiles which were shot at Vehar. One of these measured nine feet, and the other one five feet. The reward for crocodiles' eggs, found on the banks of these reservoirs, is two annas each egg, and the reward for killing crocodiles is one rupee per lineal foot of carcase on production of the saurian.

H. W. BARROW.

MUNICIPAL OFFICES, BOMBAY, 1st June, 1895.

No. II.—DESCRIPTION OF THE TRANSFORMATIONS OF
ARRHOPALA PARAMUTA, DE NICEVILLE, A
 LYCÆNID BUTTERFLY.

Two lycænid larvæ were found on the Fagoo Tea Estate in the Western Duars at 2,500 feet elevation above the sea. Length about $\frac{7}{8}$ of an inch. Onisciform, flattened, covered with downy bristles, semi-transparent, dull whitish, becoming more opaque and white dorsally; an olive-brown medial dorsal line throughout; two short white protrusible brush-like tentacles on the twelfth segment, a medial small orifice on the eleventh segment probably exuding a fluid, as it is vigorously attended by a small black ant, the latter apparently tickling the larva with its antennæ to make it do so. The larva is very similar to that of *Arrhopala abseus*, Hewitson, which I discovered on Sal trees attended by a large red ant in 1890. Before pupating the larva becomes pinkish with a tinge of purple. It feeds on the leaves of *Castaneopsis* sp.

Pupa. Pale brown, with a darker dorsal streak and irrorated slightly on the back with dark brown. Abdomen rather flattened. Emerged on 19th May, 1895, both females.

G. C. DUDGEON, F.E.S.

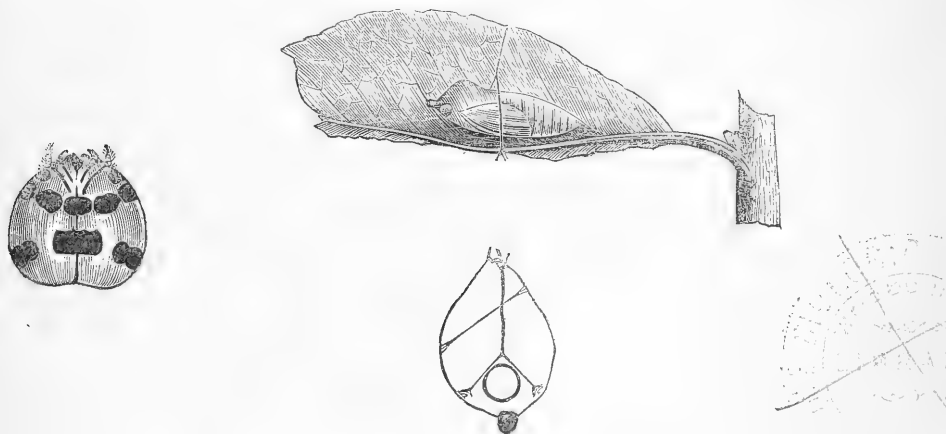
FAGOO TEA ESTATE,
 WESTERN DUARS, May 25th, 1895.

No. III.—DESCRIPTION OF THE TRANSFORMATIONS OF
BADAMIA EXCLAMATIONIS, FABRICIUS, A
 HESPERID BUTTERFLY.

A hesperid larva was found on the Fagoo Tea Estate in the Western Duars at 1,500 feet elevation above the sea. It had formed the usual case or shelter by webbing the edges of a leaf together. Superficially it was somewhat like the figure of the larva of *Hasora bhadra*, Moore, given in Horsfield and

Moore's Cat. Lep. Mus. E. I. Co., but was without the long hairs. Length rather more than an inch. Colour velvety-black with transverse patches of yellow striations on the middle of each segment divided dorsally by a black line. The segmental interspaces are yellowish, and the front of each segment is black, with a lateral row of yellow spots, one on each segment, those black portions are broadest on the second, third, fifth, seventh, ninth, and eleventh segments. Head yellow-ochre with two transverse rows of rectangular black spots, five in each row, those of the lower row being somewhat rounded and more separated; the two first of the upper row being conjoined. There is also a lower black spot out of line on each side. The larva feeds on a species of *Ficus*, called by the Nipalese "Barrha."

Pupa formed in the same manner as that of *Rhopalocampa benjaminii*, Guérin, that is to say, within a rolled up leaf, across the inner portion of which, some thick white webs or strands of silk are stretched; round the abdomen the web is fastened in a way I did not notice before, which can be seen from the accompanying sketch.



As I was fortunate enough to observe the change, I saw that, although the anal prolegs of the larva were attached to a tuft or pad of silk in the usual way and remained so until nearly the whole skin had been shuffled off, yet when the last segment had to be taken out the pupa drew it entirely away from the skin and lifted it over the empty skin, and by a series of contortions similar to those made by an insect in depositing an egg, it soon reattached its anal segment or tail to the web, throwing away the cast-off skin by wriggling its body about. When it had first changed most of the black markings of the larva were still present although reduced to spots, the ground-colour being dark yellowish. The head, as in *Choaspes* (*Ismene* and *Rhopalocampa* apud Watson) has a distinct knob. After a few hours, the pupa having become hardened, it is covered with a chalky white substance, leaving

the first two abdominal segments only without the covering. In appearance the pupa is similar to that of *Choaspes (Ismene) gomata*, Moore ; being longer than, but of a similar type to, that of *Rhopalocampta benjamini*, Guérin. The imago emerged on 19th May, 1895.

G. C. DUDGEON, F.E.S.

FAGOO TEA ESTATE,
WESTERN DUARS, May 25th, 1895. }

NO. IV.—NOTES ON SOME NILGIRI BIRDS.

The Nilgiri District, though possessing a considerable bird-fauna, has been so thoroughly worked in the past that little remains to be recorded regarding its ornithological features. Observers such as Dr. Jerdon, Miss Cockburn and the late Mr. Davison do not leave much to be gleaned by those who come after them. The last named writer published a fairly complete list of the birds of the District in "Stray Feathers" (volume x, part 5) some twelve years ago, and it is not likely that many important additions will be made to this list. The following notes consequently mostly refer to details left doubtful or unnoticed hitherto. They are the result of very scanty leisure and do not pretend to be more than hasty jottings regarding desultory observations.

The first bird I propose to refer to is that exceedingly neat and dapper individual, *Larvivora brunnea* (Hodgs.). Mr. Oates states that this bird is a permanent resident on the Nilgiris, and this statement is supported by Davison, who mentions that he twice found its nest. It is perhaps incautious to impugn these statements on merely negative evidence, but it is remarkable that in a ten-year acquaintance with the Nilgiri Sholas I have never seen this bird except in the cold months. At that time of the year it is not uncommon on the slopes of the Hills, and though very silent and unobtrusive, it is by no means shy. Mr. Bourdillon in his "First List of the Birds of the Travancore Hills" (Stray Feathers, iv. 401), expresses the belief that *L. brunnea* is only a winter visitor to that part of the peninsula. I think the question of its permanent residence on the Nilgiris should also be considered open. Is it possible that the nests which Davison assigned to this bird belonged to *Brachypteryx rufiventris* (Blyth)? It is certain that the description and measurement of the eggs coincide, and that the egg ascribed to *L. brunnea* would be very large for so small a bird.

There is another point on which I feel disposed to question Mr. Davison's authority, viz., with regard to the singing powers of *Oreocincla nilgiriensis* (Blyth). Mr. Oates writes, "Represented to be a very fine songster," and Mr. Davison states, "It is a glorious songster and its rich and varied song can be heard for nearly a mile." On the other hand, another authority, Mr. Rhodes Morgan, tells us (Nests and Eggs, ii, 108), "It utters now and then a single clear warbling note, [but appears to have no song," and my own

experience fully corroborates him. Not only have I lived in a house within a hundred yards of Sholas in which *O. nilgiriensis* breeds every year and have never heard its song, but I have now had a pair of this bird in my possession for over twelve months and can vouch for the fact that this pair at least never sing. They are almost entirely silent, their nearest approach to song being a low twittering in the spring. They possess a curious power of making a drumming, vibrating noise ; no outward movement is visible, though if they are standing on paper or a leaf, it vibrates. I have often observed *O. nilgiriensis* feeding in the Nilgiri Sholas, and it is always the most silent, as well as the shyest of birds. It would be interesting to know whether other members of the genus, such as *O. dauna*, for example, sing.

Mr. Oates tells us in his "Birds of India" (i, 294), that nothing whatever is known regarding the nests and eggs of the Genus *Micropus* (Swainson). Since then, Mr. Stuart Baker in Cachar has taken nests of *M. melanocephalus* as well as of *M. cinereiventris* (if the species are really distinct), and has published a notice of the same in the Society's Journal (vol. viii, No. 1). I am not aware, however, that any one has yet given any account of the nidification of the southern member of the genus, *Micropus phaeocephalus* (Jerdon). This bird though probably very local, is not rare on some of the slopes of the Nilgiris, and I was fortunate enough to find several nests. The nest is of the usual Bulbul type, but exceedingly slight and flimsy in structure, so that it can easily be seen through, and it is usually fastened by a few spiders' threads to the branch of a small shrub at about three feet from the ground. The nest is very shallow, being less than an inch deep inside by over two inches and a half broad. The birds breed in deep forest at an elevation of about 4,000 feet above the sea in the months of June and July and lay two eggs, which, when new, are very handsome. The ground-colour is a faint pinky-white, almost free from markings at the smaller end, while at the larger end it is covered with deep red markings, forming a complete zone and spreading in scattered blotches and spots over two-thirds of the egg. The colour is at first particularly deep and rich, but within a week of the eggs being blown it fades to such an extent that the eggs become duller in tone than those of the common Bultuls, *Otocompsa* and *Molpastes*. The eggs measure 9" x 6" and are decidedly elongated ovals, compressed at the smaller end. The birds are bold and noisy while their nest is being taken, and their outcry at my approach first led me to search the locality. I have found not less than a dozen nests of this bird within a small area, all exactly alike, but only two contained eggs, while in another there were young birds.

In the same month I also found the nest of another bird, of whose nidification I can find no record, namely, the somewhat scarce little Flycatcher, *Cyornis pallidipes* (Jerdon). This bird seems to be extremely local in its distribution. The female was first described by Mr. Davison in 1883. The nest was found at

an elevation of 4,000 feet above the sea. It was placed in a hole in a bank, under the protection of a large rock, and by the side of the old ghât-road or riding-path to Coonoor, on which scores of persons pass up and down daily. It was composed of roots on the outside, with a few dry leaves, and lined with fine fibres, and contained three young birds a few days old. On another occasion, in the last week in May, I came on a pair of this bird at about the same elevation, with fully-fledged young, so that the breeding season must extend from April to June. The female was very noisy and excited, spreading out her tail like a *Rhipidura*, and uttering a harsh, grating cry. The young of this Flycatcher, the sexes of which are so curiously unlike, are much marked with orange, and resemble the young of *Ochromela nigrorufa*, but are, of course, larger and are without the orange quills.

Hemipus picatus (Sykes) is, as stated by Mr. Davison, fairly common on these Hills, but the record of its nidification seems to be confined to that of the single nest taken by Davison, and mentioned in "Nests and Eggs," i, 328. I have found three nests, but have only once succeeded in securing the eggs. The nests, which answer closely to Mr. Davison's description, are beautiful structures, completely coated on the outside with pieces of greenish-white lichen, and lined with the finest fibre. They are very minute, the egg-cavity measuring 1.5" across and but little more than half an inch in depth inside, which shows that Captain Terry's nest, also mentioned in "Stray Feathers," l. c., was that of some other bird. The nests I found were in each case placed high up on the bare branch of a Blue-gum at Ootacamand, and were most difficult to see. One nest taken on the 24th March contained three eggs, which measured 0.6 by 0.45 inch each. Another nest which was found on the 21st May, 1895, also contained eggs, but it was full fifty feet from the ground, at the far end of a branch, and the eggs were broken. In this case, after the female was shot, the male took her place on the nest, and his tail could be seen from below, though the nest itself was hardly visible.

During the last two years several nests have been taken in Ootacamand by European boys, the eggs of which have entirely baffled all my attempts at identification. They are remarkably round, turnip-shaped eggs slightly pointed at the smaller end, and measuring about .75" × .65". The shell is very glossy, and the colour a very faint blue, in some cases without any markings, in other cases with a few faint clouded brownish streaks most irregularly distributed. The nest is said to be placed on the ground, and the bird to resemble *Pratincola atrata*. Unfortunately, I have always been absent from Ootacamand when the nests were found, i.e., in February and March. *Pratincola atrata* is so numerous here that it is possible that these eggs are "sports," as last year I obtained a nest of *Merula simillima*, shooting the female as she left it, the eggs in which were absolutely free from all markings, and like those of a Myna. On the other hand, the commonness of *P. atrata* may possibly have led to some other bird's presence being overlooked. Can *Ruticilla*

rufiventris ever remain to breed on these Hills? The bird has undoubtedly been shot on the plains of India in the summer, as Mr. Oates' note in "Nests and Eggs," ii, 64, shows.

A. G. CARDEW.

OOTACAMAND, 20th June, 1895.

P. S.—Since the above was written I have also obtained two nests of *Arachnothera longirostris*, regarding the breeding habits of which in India no information was available when Mr. Oates wrote. Mr. J. Davidson has meantime taken the eggs in North Kanara. Of my nests one was on a Plantain leaf, the other on the broad leaf of a jungle plant. The nest is large, built of fine fibres, and ornamented on the outside with "Skeleton" leaves. The eggs were two in number, white, with reddish-brown spots.

A. G. C.

18th September, 1895.

NO. V.—THE NESTING OF THE LONG-EARED OWL (*ASIO OTUS*) IN INDIA.

As there appears to be no record of the eggs of the long-eared owl (*Asio otus*) having been taken in India, possibly the following might be of some interest.

While after bear (*U. isabellinus*) on the Hills above Guraïs in Kashmir on 4th June, 1895, I found a nest containing four eggs of this owl in a sycamore tree, at a height of about twelve feet from the ground, and I also shot one of the parent birds for identification.

The nest which was a mere platform of sticks, with no pretence at a lining, had doubtless, from its weather-beaten and delapidated appearance, been originally occupied by some other bird, probably a crow.

The eggs were much incubated and would, I think, have hatched in a few days.

They are broad white ovals, slightly glossy and measure 1.62" × 1.35".

On several occasions I heard owls hooting in the evening, which I believe belonged to this species, so that it is probably not an uncommon bird in Kashmir at suitable elevations.

The eggs I took were found, as far as I could judge, at an elevation of about 9,000 feet, but I heard birds lower than this. In the neighbourhood of the valley itself, say, from 5,500 to 6,500 feet the only owl I saw or heard was *Bubo bengalensis*.

22nd July, 1895.

BERTRAM A. G. SHELLEY, LT., R.E.

NO. VI.—MEASUREMENT OF TIGERS' SKULLS.

With reference to Mr. W. S. Millard's note on this subject, dated December, 1893, (vol. viii, page 447), and Surgeon-Captain H. F. Cleveland's communi-

cation, dated March, 1894, (vol. viii, page 554) the following measurements of a tiger's skull are, I think, worth recording :—

Length, between uprights	...	15.10 inches.
Width	do.	... 10.50 „

This skull is larger than the specimen in the Indian Museum, Calcutta, which has been so often referred to.

The tiger was shot in Kanara, on the 10th May last, by Mr. Phelps, Executive Engineer, and the skull is now in his possession. The animal is described as being a very large one, but it only measured 9' 4½" on account of its exceptionally short tail. The measurements of the skull have been most carefully taken.

F. A. HILL.

KARWAR, N. KANARA, *July*, 1895.

NO. VII.—THE IDENTIFICATION OF BIRDS.

I notice Mr. Oates' remarks in the last number of this Journal (No. 4, vol. ix, page 486,) on a young bird I described some months ago in the *Asian* as being an immature *Dicrurus ater*, and which Mr. Oates identifies as being *Surniculus lugubris*. I have to thank him for his correction; quite possibly I was wrong, but unfortunately the specimen is now at home. At the same time Mr. Oates' extreme sensitiveness has caused him to read somewhat crookedly, and I think, if he refers to my notes again, he will find that I referred to this specimen as being rather an abnormal one. Several that I had procured before were, as a rule, exceedingly black and freely splashed with white, so that the peculiar distribution of the markings in this specimen struck me as worthy of mention. Had Mr. Oates' 3rd volume then been available, I probably should not have made this very easily made mistake, but the young of all birds are, as a rule, in most works, very poorly described.

I think the only time I hinted at Mr. Oates' description of a bird being actually *wrong* was in his description of *Dicæum cruentatum*, where he says the young resemble the female. This, as far as my experience goes, is not correct.

No one values Mr. Oates' work more than I do.

H. A. HOLE.

CACHAR, 6th *August*, 1895.

NO. VIII.—THE FOOD OF THE BULL-FROG.

While living near Government House, Parel, I had in my compound two broods of guinea-fowl chicks of about a dozen each, the one brood being a fortnight older than the other. When the younger brood were about a week old, both they and the elder brood began mysteriously to disappear, at least one and sometimes two per day becoming missing. Of course, I suspected the servants, as we always do in such cases, and my suspicions were specially directed

to the cook, as the two broods used to go about in a patch of long grass between the croquet-ground and the cook-room. One morning my suspicions had become insupportable, I got up early, watched the cook go off to market, and carefully counted the chicks; an hour after I counted them again, and found one missing. On this day at least he was not to blame, so, after some consideration, I organized a beat of all the servants and ghorawallas in the patch of long grass. I found the culprit in a bull-frog, which, like Mark Twain's immortal specimen, tried to jump, but was so heavily weighted as to fall on his back. Having speedily despatched him and cut him open, I found inside him no less than three guinea chicks, two of which, his previous day's feeding, were much decomposed, the third being quite fresh and undigested, having only just been swallowed.

After that summary execution the remainder of my two guinea broods thrive in peace.

D. GOSTLING, F.S.A.

BOMBAY, 12th July, 1895.

NO. IX.—THE IDENTIFICATION OF BIRDS.

Mr. E. W. Oates, in volume ix, No. iv, of this Journal, draws attention to the fact that I cannot, with the help even of his book, find any permanent or invariable difference between the two species of minivets, *fraterculus* and *speciosus*. I am very sorry that this should pain him, but in spite of my sorrow I cannot change my opinion. Mr. Oates says that I have given a hasty opinion without consulting his key. Now I must state that I have gone very thoroughly through this key and I have found it most misleading. For instance, *P. brevirostris* is fairly common here and I have got a good many specimens, but when I got my first one I at once jumped to the conclusion that I had a new species, for my bird had the inner secondaries—tertiaries as they are called by Mr. Oates—most distinctly spotted. Unfortunately, a comparison with the birds of this species in other collections, amongst them those in the Indian Museum, Calcutta, I find that it seems to be the rule for Eastern specimens to be thus marked. Yet Mr. Oates makes the unspotted inner secondaries the main distinctive feature in his key.

I regret that more than half the minivets in my possession have been packed to go home, but taking the twenty specimens of *speciosus* vel *fraterculus* I now have I find that the length of the tails are as follows:—

Males—4.2", 4.1", 4.05", 3.96", 3.95", 3.9", 3.9", 3.8", 3.78", 3.6".

Females—4.2", 4.12", 4.1", 4.08", 3.92", 3.84", 3.82", 3.8", 3.75", 3.7".

Does Mr. Oates' key help me here, his distinctive feature being "tail exceeding 4" *speciosus*; "tail not exceeding 3.5" *fraterculus*?

Mr. Oates says that I am expressing a "hasty opinion." I would rather suggest that his assertion itself might be thus designated. I have worked at

these birds for years, and the opinion expressed is the result of a mass of measurements and other notes taken during a period extending over about eight years. Again, he says that I have "laboured hard to make them"—my specimens—"into two species." Quite the contrary. The fact is that I have certain birds which are *fraterculus* and certain which are *speciosus*, as defined by Mr. Oates, but on the other hand I have many more which can be placed definitely under neither of these names, but appear to me to form the connecting link between the two; and so far from trying to split my specimens into two lots, I am anxious to prove that they all belong to one and the same species.

Mr. Oates seems to think that I wish to personally hurt his feelings, and that I differ from him solely for this purpose. I again express my regret that he should be hurt at my—or any one else's—opinion being different to his own. I may add that much of what I know of ornithology has been learnt from his works, and that he can have no greater ornithological admirer than myself. As regards Mr. Hole's criticism, surely an ornithologist of Mr. Oates' standing can afford to utterly ignore such and to treat the matter as a ludicrous one, as does every one else.

Finally, I may mention that I am sending home a series of minivets to the Hon'ble W. Rothschild, and I hope that either he or Mr. E. Hartert will look still further into the question.

E. C. STUART BAKER, F.Z.S.

No. X.—AN ANT-LION UP A TREE.

I saw something in a spider's web in a mango tree. Thinking it was the owner of the premises, I bottled it straight away, without preliminary inquiry. You cannot be too inquisitive about a spider beforehand if you think of catching him afterwards. Like the opossum he does not wait for you to shoot: he comes down. Imagine my surprise on discovering that I had caught a dead ant-lion. Now what was he doing in that web six feet from the ground, and how did he get there? I say an "ant-lion," because I believe that is the popular nick-name. Will you kindly supply its proper christian name and surname,* titles and dignities? Professionally, as far as I have seen, he is a garotter with a taste for grave digging; for "when the cut-throat is not occupied with crime," he buries himself, and does it as if he liked it.

It is a little creature about as big as an undersized shirt-button, but more oval than round and humped. To put it vulgarly, very like a wood-louse, only hairy on the top. So much for the body. From one end of it projects a neck like a turtle's. At the end of the neck is a small flat wicked-looking

* The ant-lions are the larvæ of those beautiful *Neuropterous* insects, popularly known as "lace-wings." They belong to the family of *Myrmeleonidæ* and are closely allied to the termites.—*Editor*.

head, and then come two enormous scythes quite out of proportion to the size of the creature, but rather small than otherwise compared to its villainy. These scythes under a lens are toothed. Why is it called an "ant-lion?" It is quite as like a rabbit as a lion and is not much more like an ant than you or I. Imagine one of these creatures the size of a horse! How we should run! Though common enough, they are by no means easy to get, because even when you get them out of the sand they live in, they look exactly like a pellet of sand as they curl themselves up and the sand sticks in the bristles. When you press a pellet of sand with the forefinger, it disintegrates: when you press an ant-lion "made up" to represent a pellet of sand, it does not. I know of no other rough and ready test. Put an "ant-lion" on the table and it looks and behaves like a fool, put it on sand, and you will have to be quick if you want to say "good-bye." A wriggle or two, and it's gone—backwards down into the sand.

In ordinary life he makes a funnel in the sand, by gathering the sand on his head and scythes, and jerking it over his left shoulder,—in much the same way as superstitious people do when they spill the salt,—and it is surprising how far he can throw and what a neat funnel he makes. Having made it he sits below with "gently smiling jaws" waiting for weary ants to "drop in." When an ant rolls down it's soon all over. The ant-lion catches it at once and buries itself, and when the ant is quite done with, reappears. The desiccated ant is ejected and the funnel set in order for the second course.

A. E. RYVES.

ALLAHABAD, *September*, 1895.

NO. XI.—A TURTLE KILLING A CROCODILE.

A few days ago when out in camp I rested for a time on the bank of a small river. There was a pool of very clear water about 50 yards long and some four or five feet deep, and I could see the fish swimming about in it plainly.

Immediately in front of me was a submerged rock with a sloping surface, the top being some six or more inches under water. I happened to be watching a big fish moving near this rock, when suddenly a small fish-eating crocodile came and sat on the rock. He sat up with his eyes level with the water and began to watch me. I sat quite still and watched him. Suddenly I saw a swirl in the water, and something seized the crocodile from behind and passed over the rock into deep water. I saw that it was a turtle about two feet six inches long. Then began a fight which lasted perhaps three-quarters of an hour. The pair splashed about all over the place. The crocodile was at times lifted half out of the water, and I could see him twisting round to try and catch hold of his enemy. After a time the crocodile became exhausted,

and the turtle dropped him, and he rose to the surface and rolled over and over. Then the turtle caught him again, and began taking a series of dives from one end of the pool to the other. The pace was astonishing. Backwards and forwards they went, and at each turn, when they came to the surface, the crocodile's head came out of the water and he gasped for breath. The turtle was apparently drowning him. Eventually he no doubt considered he was harmless and swam with him to the tank and tried to get out of the water. The steepness of the tank, however, defied him, and he gradually worked his way round to a place where cattle had made a path down. Here he pushed the crocodile out of the water where I, who had crawled to the spot, gave him a rap on the nose with a cane. In his astonishment he dropped the crocodile, which I appropriated. He probably thought it hard luck, but I wanted the skin.

This, however, was of little value, as I found that at the point of first seizure, namely, at the junction of the hind legs with the back bone, the animal was virtually cut in half.

It was a most interesting sight, and as it caused me some considerable excitement to view, it occurred to me you might care to hear of it.

“MOIDART,”

ULWAR, RAJPUTANA, 15th September, 1895.

NO. XII.--LEOPARD *versus* PORCUPINE.

I dare say some members of the Society have heard, and may possibly have seen, an example of a tiger which has met its death from eating a porcupine in a hurry and the quills sticking in the gullet; but it may not also be known that leopards occasionally die from the same cause. The other day, when out shooting in a Mysore forest, I came across the dead body of a small, but fully grown, leopard which had apparently been dead for some hours. On examining the body I found a number of porcupine quills sticking in various parts. One paw was in its mouth, and on removing it and looking down the throat I noticed quite a number of quills sticking up, which apparently were the cause of the animal's death. I was unable to find any part of the porcupine's body, but at a short distance behind the leopard I found a number of large quills and a good deal of blood. It appears to me strange that, if tigers and leopards habitually eat porcupines, natural instinct has not taught them to avoid bolting the quills.

G. S. RODON, MAJOR.

MYSORE, 19th September, 1895.

PROCEEDINGS

OF THE MEETING HELD ON 18TH JULY, 1895.

A meeting of the members took place on Thursday, the 18th July, 1895, Dr. D. MacDonald presiding.

NEW MEMBERS.

The election of the following new members was announced :—

MEMBERS—Mr. G. Keatinge, I.C.S. (Dharwar); Mr. D. G. Ommaney (Ahmednagar); Mr. A. M. Long (Assam); Dr. Virji Jhina Ravul (Bombay); Mr. J. N. Unwalla (Bhownugger); Mr. C. G. Giro (Bombay); Mr. C. F. Bamford (Cachar); Mr. E. R. Smetham (Bombay); Mr. M. Anderson (Calcutta); Major H. D. Keary (Burma); Mr. E. H. Dwane (Secunderabad); Mr. W. B. de Courcy (Jalpaiguri); Lieutenant A. S. Capper (Goona); Mr. Vishwanath P. Vaidya (Bombay); Lieutenant A. St. John Cooke (Jalna); Mr. John Greaves (Bombay); Mr. Kunwar K. Pal Singh (Agra); Mr. James Marten (Raipur); Surgeon-Major M. O'C. Drury (Kampti); Mr. N. F. S. Troup (Kasanni); Surgeon-Captain H. Herbert (Bombay); Mr. G. C. Dudgeon (Jalpaiguri); Doctor A. H. Deane (Bombay); Mr. E. I. B. Chapman (Orissa); and Mr. M. G. Peddie (Assam).

CONTRIBUTIONS.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged the following contributions received since the last meeting :—

Contribution.	Description.	Contributor.
1 Sarus Crane	<i>Grus antigone</i>	Mr. John Griffiths.
1 Daboia	<i>Vipera ruselli</i>	Mr. Bazonji Ardeshir Kandawalla.
Land Shells from Landour...	.....	Mr. Jas. Betham.
1 Elephant's Tusk .....	.....	Mr. F. D. Whiffen.
1 Hume's Pheasant	<i>Phasianus humie</i>	Major H. D. Keary.
1 Speckled Wood Pigeon ...	<i>Alsocomus hodgsonii</i>	Do.
2 Snakes	<i>Lycodon aulicus</i>	} Mr. W. W. Coen.
	<i>Tropidonotus plumbicolor</i> ...	
1 Lizard	<i>Eumeces punctatus</i>	Do.
A number of Birds, mounted.	.....	Mr. Chas. Maries.
1 Chameleon (alive)	<i>Chameleon vulgaris</i>	Mr. J. Duce.
1 Hamadryad (alive)	<i>Naga bungarus</i>	Mr. Hugh Murray.
1 Wood Shrike with Nest....	<i>Tephrodornis pondiceriana</i> .	Mrs. H. C. Pearson.
1 Crocodile, mounted	<i>Crocodilus palustris</i>	Mr. J. F. Snuggs.
1 Hamadryad	<i>Naga bungarus</i>	Mr. T. R. D. Bell.
1 Snake (alive)	<i>Tropidonotus stollatus</i>	Mr. E. H. Elsworthy.
1 Minivet's Nest	<i>Pericrocotus perigrinus</i>	Mr. C. E. Crawley.
1 Monkey's Skin	<i>Macacus rhesus</i>	Mr. B. A. Gupte.
1 Screech Owl (alive)	<i>Strix javanica</i>	Mr. W. George.
3 Snakes (alive)	<i>Zamenis fasciolatus</i>	} Mr. Bazonji Ardeshir Kandawalla.
	<i>Tropidonotus stollatus</i>	
	<i>Dryophis mycterizans</i>	
1 Hamadryad (alive)	<i>Naga bungarus</i>	Deposited by Major Rodon.
1 Lizard	<i>Lygosoma punctatus</i>	Mr. J. Stiven.
1 Pied Crested Cuckoo (alive)	<i>Coccyzus jacobinus</i>	Capt. W. G. Hatherell.
1 Screech Owl (alive)	<i>Strix javanica</i>	Mr. Douglas Bennett.
Eggs of Myna	<i>Acridotheres tristis</i>	Mrs. H. C. Pearson.

Contribution.	Description.	Contributor.
Eggs of Magpie Robin.....	<i>Copsychus saularis</i>	Mrs. H. C. Pearson.
1 Flying Lizard (alive)	<i>Draco dussumieri</i>	Mr. T. D. R. Bell.
2 Monitors (alive)	<i>Varanus griseus</i>	Mr. W. A. Light.
1 Gaur's Head	<i>Bos gaurus</i>	Deposited by Major Rodon.
1 Nilgiri Wild Goat.....	<i>Hemitragus hylocrius</i>	Do.
1 Elephant's Foot.....	<i>Elephas indicus</i>	Do.
A pair of Elephant's Tusks ...	Do.	Do.
1 Flying Squirrel.....	<i>Pteromys oral</i>	Do.
1 Malabar Squirrel	<i>Sciurus malabaricus</i>	Do.
2 Langurs	<i>Semnopithecus entellus</i>	Do.
1 Dhaman	<i>Zamenis mucosus</i>	Do.
2 Bears' Skulls	<i>Melursus ursinus</i>	Mr. S. Rebsch.
1 Tiger's Skull	<i>Felis tigris</i>	Do.
1 Panther's Skull	<i>Felis pardus</i>	Do.
A number of Crabs .....	.....	Mr. E. H. Aitken.
A collection of Shells .....	.....	Do.
1 Water Cock	<i>Gallix cinereus</i>	Mr. A. Francke.
Bones of a Panther	<i>Felis pardus</i>	Surg-Lt-Col Barker.
1 Wood Duck	<i>Anas leucoptera</i>	Mr. C. A. W. Bruce.
4 Young Crocodiles (alive) ..	<i>Crocodilus palustris</i>	Surg-Capt Whitecomb.
A Panther's Skull with abnormal dentition	<i>Felis pardus</i>	Lieut. D. O. Morris.
A number of Rock Scorpions (alive)	<i>Scorpio swammerdami</i>	Mr. Bazonji A. Kandawala.
1 Black Panther's Skull	<i>Felis pardus</i>	Mr. H. G. Battan.
A collection of Chrysideae ...	.....	Le Vicomte du Buysson.
1 Red Jungle Cock .....	.....	Mr. H. H. Swan.
1 Snake (alive)	<i>Tropidonotus plumbicolor</i>	Mr. F. Otto.
A collection of Birds' Skins from Cachar .....	.....	Mr. E. C. S. Baker.
1 Brown-headed Gull	<i>Larus brunneicephalus</i>	Surg-Col T. S. Weir.
1 Snake (alive)	<i>Eryx johnii</i>	Mr. B. A. Gupte.
1 Florican (alive)	<i>Syphocides acrita</i>	Mrs. H. C. Pearson.
1 Black-headed Bunting (alive).....	<i>Euspiza melanocephala</i>	Do.
2 Red-whiskered Bulbuls (alive)	<i>Otocompsa fuscicaudata</i>	Do.
1 Large Crab (alive)	<i>Cancer integrifortis</i>	Mr. N. S. Symons.
Skin of Wild Dog	<i>Cyon dukhunensis</i>	Mr. N. C. Macleod.
2 Laughing Jackasses (alive) ..	<i>Cacelo gigantea</i>	Mr. M. T. Carroll.
1 Duck-billed Platypus	<i>Ornithorynchus anatinus</i> ...	Do.
6 Eggs of White-eyed Pochard	<i>Saligula nyroca</i>	Mr. B. A. Shelly, R. E.
7 Eggs of Moor Hen	<i>Gallinula chloropus</i>	Do.
7 Eggs of Whiskered Tern...	<i>Hydrochelidon hybrida</i>	Do.
A large Hornet's Nest.....	<i>Vespa cincta</i>	Mrs. Watson.

MINOR CONTRIBUTIONS.

From Mrs. Murray Annesley, Mr. Chandrika Prasada, Mr. R. D. Lindsay, and Mr. A. Herbert.

CONTRIBUTIONS TO THE LIBRARY.

Seventeen Trips through Somali-land (Captain H. G. Swayne)—from the Author; Proceedings of the Zoological Society of London, Part IV, for 1894, from Mr. W. F. Sinclair; Transactions of the Entomological Society of London

for 1894—in exchange. Records of the Geological Survey of India, Part II, Vol. XXVIII—in exchange.

THE LATE LIEUT. H. E. BARNES.

The Honorary Secretary stated that the Society has suffered a serious loss in the death of Lieutenant H. E. Barnes, F.Z.S., who had been a most valuable contributor to the Journal for the last eight years. All ornithologists were well acquainted with the excellent work done by this gentleman, and as the author of that most useful handbook entitled the “Birds of Bombay,” Lieutenant Barnes had earned an extensive reputation as an enthusiastic naturalist and a careful observer. The important series of papers on “Nesting in Western India,” which were written for the Society’s Journal by Lieutenant Barnes, commenced in No. 4, vol. iii, and were concluded in No. 3, vol. vi. The beautiful illustrations of nests and eggs which accompanied these papers were all from drawings made by the author. It was resolved that the sympathies of the meeting should be conveyed to Mrs. Barnes in a letter of condolence.

THE JOURNAL.

The Honorary Secretary stated that No. 4 of vol. ix of the Society’s Journal was now being distributed to the members, and that No. 5, containing the Index and four additional coloured plates, would shortly be published. The volume would then be completed and would consist of 510 pages with 25 full-size illustrations. The cost of producing the Journal had been considerably increased of late, owing to the import duty charged on the plates which were printed in England. The accounts showed that the Society had spent Rs. 8,663 on the Journal during 1894, compared with Rs. 5,793 in 1893, but the large increase in up-country members proved that the money had been well spent and that the results were appreciated. As the revenue of the Society increased, the scope of the Journal would be still further enlarged, and members who were not in a position to assist in other ways might draw the attention of their friends to the Journal with a view of inducing them to become members of the Society. Considering that the subscription was only Rs. 15 per annum and that there were very few Englishmen in this country who did not take an interest in some branch of Natural History, there appeared to be no reason why the growth and usefulness of the Society should not be very greatly extended.

PAPERS READ.

The following papers were then read and discussed :—(1) Shooting *Ovis polii* on the Pamirs, by Baron Edmond de Poncins; (2) Birds of the Nilgiri Districts, by A. G. Cardew, I.C.S.; (3) Field Notes with the Chitral Relief Force, by Major W. St. John Richardson; (4) Snakes found in Travancore, by H. S. Ferguson, F.Z.S.; (5) Do Ants produce Audible Sounds? by Robert. C. Wroughton; (6) Seeds germinating in a Hen’s Egg, by Mrs. Pechey-Phipson, M. D.

PROCEEDINGS

OF THE MEETING HELD ON 19TH SEPTEMBER, 1895.

A meeting of the members and their friends took place on Thursday, the 19th September, Mr. J. D. Inverarity presiding.

ELECTION OF MEMBERS.

The election of the following new members was duly announced :—Colonel A. Howlett, I.S.C. (Mandalay), Mr. A. G. Trapman, C.E. (Rangoon), Mr. F. L. Wallace (Bombay), Mr. G. W. Gayer (Sambalpur), Mr. P. J. Mead (Ahmedabad), Mr. James P. Orr (Poona), Surgeon-Major H. Greany (Raichore), Surgeon-Captain David Prain (Calcutta), Rev. E. J. Bowen (Belgaum), Mr. J. Brand (Callian), Lieutenant E. H. Lewis (Trimulgherry), Mr. Frank Muir (Jhansi), Mr. H. V. Kemball, C. E. (Sukkur), Mr. J. H. Clabby (Barwani), Mr. A. R. Wilson (Benares), Mr. Hurkisondass Nurrotumdass (Bombay), Mr. Walter C. Stanton (Rangoon), Lieutenant A. N. Fagan (Raichore), Mr. J. P. Lord (Surat), Mr. John Lees (Cachar), Lieutenant W. Beadon (Kohat), Miss Lillian Trewby, M. D. (Amraoti), Mr. E. Tooth (Bombay), Lieutenant H. A. D. Fraser, R.E. (Masuri), and Mr. R. G. Currie (Bombay).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged having received the following contributions to the Society's Museum since the last meeting :—

Contribution.	Description.	Contributor.
1 Tiger Shark.....	<i>Stegostemæ tigrinum</i>	Capt. Thorburn.
Skull of Brown Bear	<i>Ursus arctus</i>	Lieut. B. A. Shelly, R. E.
2 Snakes.....	<i>Simotes arnensis</i> & <i>Oligodon dorsalis</i>	Mr. P. H. Clutterbuck.
A number of Photographs of Animals .....	.....	Capt. F. Williams.
The Skeleton of a Grampus..	<i>Orca gladiator</i>	Mr. W. G. Betham.
A number of Sea Shells.....	.....	Lieut. A. J. Peile, R. A.
1 Snake	<i>Simotes arnensis</i>	Mr. R. Hayter.
A number of Land Shells ..	.....	Mr. W. Mahon Daly.
1 Snake	<i>Tropidonotus stolatus</i>	Mr. F. A. Little.
1 Snake	<i>Tropidonotus plumbicolor</i> ...	Mr. P. H. Clutterbuck.
1 Four-legged Chicken .....	.....	Mr. C. Olcese.
3 Eggs of the Black-capped Blackbird	<i>Merula nigropileæ</i>	Vet.-Maj. J. Mills.
2 young Crocodiles (alive)	<i>Crocodylus palustris</i>	Mr. R. P. Lambert.
1 Snake (alive).....	<i>Dipsas trigonata</i>	Mr. E. H. Elsworthly.
1 Skeleton of a Gooch	<i>Arius sona</i>	Lieut. A. Fagon.
1 Palm Civet (alive)	<i>Paradoxurus niger</i>	Mr. C. McCarty.
1 Chameleon (alive)	<i>Chamæleon calcaratus</i>	Surg.-Capt. R. Henderson.
2 Lizards (alive).....	<i>Uromastrix hardwickii</i> ...	Lieut. W. A. Light.
2 Lizards (alive)	<i>Acanthodactylus micropholis</i>	Do.

Contribution.	Description.	Contributor.
A number of Photographs of Animals .....	.....	Mr. H. A. Heath.
Eggs and Nest of Black-breasted Weaver Bird ...	<i>Ploceus bengalensis</i>	Mr. J. Reahling.
1 Snake	<i>Dipsas trigonata</i>	Mr. H. O. Campbell.
1 Bat	<i>Nicticejus kuhli</i>	Mr. J. Brand.
1 Snake	<i>Zamenis fasciolatus</i>	Do.
A number of land Shells from Jubbulpur .....	.....	Mrs. Watson.
Scorpions and Lizards from Aden .....	.....	Capt. Shopland.
1 Snake (alive)	<i>Dipsas trigonata</i>	Mr. J. Furdonjee.
1 Black Buck head (deformed)	<i>Antilope cervicapra</i>	Mr. H. F. Cotgrave.
A pair of Florican	<i>Sypheotides aurita</i>	Major A. Collins.
4 Eggs of Florican	Do.	Do.
4 Eggs of Sarus	<i>Grus antigone</i>	Do.

A VALUABLE COLLECTION FOR SALE.

The Honorary Secretary drew the attention of the members to the valuable collection of Indian Birds' Eggs made by the late Lieut. H. E. Barnes, author of "The Birds of Bombay," &c., which was now for sale. It consisted of several thousand eggs of 767 species, mostly in clutches, collected by Lieutenant Barnes during the last twenty years; together with a complete catalogue and carefully prepared notes as to when and where the eggs were taken. There were also 382 skins of Indian birds in excellent preservation.

PAPERS READ.

The following interesting papers were then read and discussed:—(1) The Indian Wild Buffalo, by J. D. Inverarity; (2) Notes on the Tsaing, or Banting (*Bos sondaicus*), by Vet.-Capt. G. H. Evans; (3) The Birds of the Ruby Mine District, by E. W. Oates; (4) Further Notes on Man-eating Tigers, by Reginald Gilbert; (5) The Cashew-nut, by Surg.-Major K. R. Kirtikar.

The Honorary Secretary stated that the papers which had just been read would appear in the Society's Journal No. I of Vol. X, which would be published in about a fortnight, together with No. 5 of Vol. IX.

The meeting then ended with a vote of thanks to the authors of the papers.



Bombay Natural History Society.

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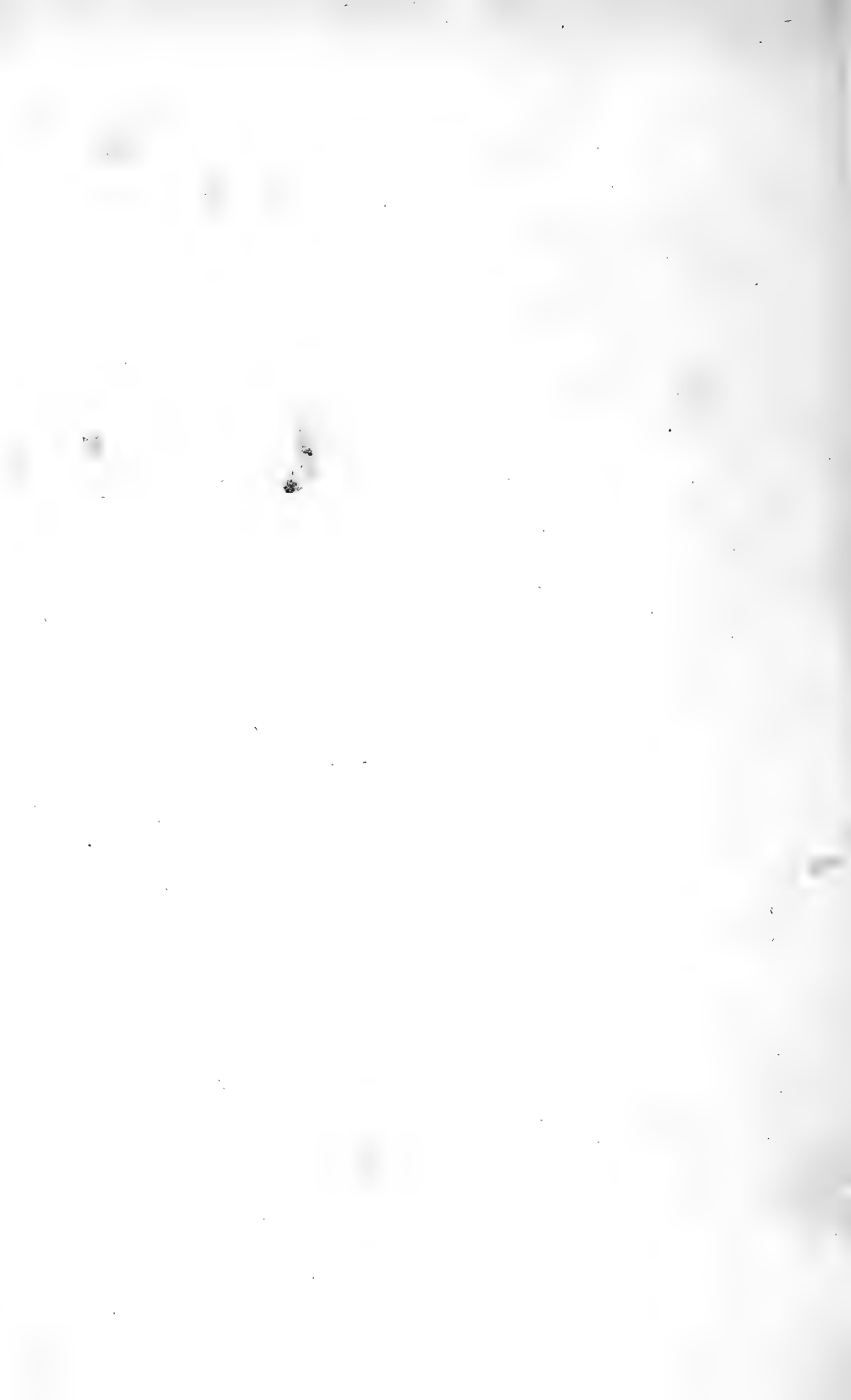
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THE
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ECS Baker del

Mintern Bros. Chromo Lith. London.

DICÆUM CHRYSORRHŒUM.

The yellow-vented Flower-pecker



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[No. 2.

THE BIRDS OF NORTH CACHAR.

PART V.

By E. C. STUART BAKER, F.Z.S., M.B.O.U.

(With Plate E.)

(Continued from page 12.)

Family *Dicacidae*.

(364) *DICÆUM CRUENTUM*.—The Scarlet-backed Flower-pecker.

Hume, No. 236 ; Oates, No. 912.

Rather common throughout Cachar. I have not personally noticed it very high up, but one of my collectors obtained it at Guilang, about 4,000 feet elevation. I have taken some half-dozen nests, and found them to be like the one taken by Oates ("Nests and Eggs," Vol. II, page 270).

I have seen none like that described by Mr. Cripps, and my nests have also averaged somewhat larger, probably about $3.25'' \times 2.75''$ or a little less.

My eggs average only $.52'' \times .37''$.

(365) *DICÆUM CHRYSORRHEUM*.—The Orange-bellied Flower-pecker.

Hume, No. 237 ; Oates, No. 914.

Perhaps more common than *D. cruentatum*, and certainly ascends higher, for I have myself seen it at Guilang, Chota Ninglo, and other places, over 4,000 feet.

The lower mandible in the live bird is yellowish at the base, not grey, as is shewn in the plate. The irides are orange, orange-red,

orange-bronze, or dull crimson, and I cannot make out that the colour refers in any way to sex or age.

The nest of this bird is quite typical of the family, that is to say, it is a small purse made of seed-down, cotton, and other similar soft materials—feathers I have never known the bird make use of—fastened together with fine grasses, fibres, and generally a good many cobwebs. The lining is made of the very softest of *simul* down, and is very neatly matted down into the interior of the nest.

As a rule it is not fastened to anything far from the ground, a slender hanging twig, falling within some four to eight feet, being the height which seems to be preferred.

My eggs average about $\cdot 63'' \times \cdot 45''$, and are of the soft chalky texture common to all the family. They are, of course, pure white.

(366) *DICEUM IGNIPECTUM*.—The Fire-breasted Flower-pecker.

Hume, No. 241 ; Oates, No. 915.

I have only seen one pair of these birds. These were shot out of a small flock which were searching for insects in low bushes by a roadway close to Diyungmukh at the extreme north of the district. It must be a very rare bird, as I have not heard of any one else meeting with it, and some Cacharies and Mikirs, to whom I shewed the birds had no name for them and did not seem to recognize them at all.*

(367) *DICEUM OLIVACEUM*.—The Plain-coloured Flower-pecker.

Hume, No. 237 Ter.; Oates, No. 917.

Extremely common everywhere above 1,000 feet up to the very highest peaks; breeding principally at about 4,000 feet. It is sometimes seen in the plains, but seldom wanders out of the hills.

The nidification differs in no way from that of *D. concolor*; the nest is a tiny purse of soft down, well matted together and bound with a few fibres and many very fine shreds of grasses.

It is not, however, built in such lofty situations as is that of *D. concolor*, and is, more often than not, placed on twigs not more than six feet from the ground. My eggs average about $\cdot 57'' \times \cdot 40''$, which appears to be a good deal smaller than are the eggs of *D. concolor*.

* Since writing the above, I have seen a good many more of these birds, and I find they are not uncommon at Hungrum and on the surrounding high peaks, but, when feeding on high trees, as they seem generally to do, it is not easy to tell them from others of the same family. I find them breeding at Hungrum.

(368) *DICEUM ERYTHORHYNCHUS*.—Tickell's Flower-pecker.

Hume, No. 238 ; Oates, No. 919.

A very rare bird in Cachar, but is sparsely scattered throughout the whole of it. I have seen a specimen from near the extreme north, and another from Hailakandi in the south.

(369) *PIPRISOMA SQUALIDUM*.—The Thick-billed Flower-pecker.

Hume, No. 240 ; Oates, No. 921.

This is the common form in Cachar after all, and not the next bird *P. modestum*, as Oates suggests. I fancy I see ten at least of this bird to every one of *P. modestum*.

(370) *PIPRISOMA MODESTUM*.—Hume's Flower-pecker.

Hume, No. 240 Sex ; Oates, No. 922.

The nest of this bird differs in no way from that of *P. squalidum*. The description given by Captain Beavan ("Nests and Eggs," Vol. II, page 278) of the nest of that bird would have stood perfectly well for the two I have seen of this.

One of my eggs, however, is rather peculiar; the ground-colour is of the usual creamy-pink, but the markings are very bold and are almost confined to a broad irregular ring at the larger end. They consist of large blotches of brownish-red, running into and over-laying one another, the colour being, so to speak, doubled in depth where they coalesce, and there are also secondary smaller blotches of lavender and pinky-grey. *Outside* the ring there are only a few small blotches and freckles of both kinds; *inside* they are fairly numerous. The egg is a broad oval, rather inclined to the peg-top shape, but is not very pointed.

It measures $\cdot 64'' \times \cdot 50''$ fully.

Family *Pittidae*.

(371) *PITTA NEPALENSIS*.—The Blue-naped Pitta.

Hume, No. 344 ; Oates, No. 927.

In a freshly prepared skin the male bird will be seen to have a far brighter pink hue on the lower plumage than is ever shown on that of the female. Moreover, the extent of blue on the nape is far greater in extent in the male than it is in the opposite sex, and it is also much brighter. The general difference is altogether a great deal more distinct than one would imagine from reading Oates's remarks in "The Fauna of British India." I have noted the colour of the soft parts as

follows:—Tall, horny; gape, dull purple; mouth, dark flesh colour; edges of eye-lids, dull flesh colour; irides, vandyke-brown (Jerdon says lightish brown); legs varying from pink flesh-colour to dull reddish-slate colour; soles, paler fleshy-pink; claws, almost white.

The female has the edge of the maxilla and nearly the whole of the mandible flesh-colour or horny flesh-colour, the tip being less pink than the rest.

Hume's "Nests and Eggs" gives such an incomplete description of the eggs of this very common species that I add a few notes about those taken by myself.

The ground-colour of the eggs is, as described, white, sometimes faintly tinged with pink; and the markings range from a pale rufous or reddish to a deep purple or blackish-brown.

In the majority of eggs these markings consist of spots and small irregular blotches, whilst in others the blotches are larger and are more or less intermingled with short broad streaks and straggling lines, and other kinds of marks.

In those eggs in which the markings are of the darker tints there are generally some of dark brown as well, and also a few of very faint grey. In some of my eggs the spots, blotches, etc., are almost entirely absent, and in others they are very numerous over the whole surface. Typically, the markings are rather numerous towards the bigger end, and somewhat scanty elsewhere.

One clutch is minutely speckled all over with pale rufous. Another has only a few spots of pale lavender; a third is densely covered with short scraggly lines of very dark purple-brown mixed with spots and specks of the same colour as well as subordinate ones of grey.

Yet a fourth type is thickly *freckled* with darker colours, and this type is not at all uncommon.

One hundred eggs average $1.14'' \times .90''$, and they vary in length between $.89''$ and $1.28''$ and in breadth between $.79''$ and $1.10''$.

I have taken three eggs, hard set, from a nest, and have also seen seven in a nest more than once.

(372) PITTA CYANEA.—The Blue Pitta.

Hume, No. 344, Ter.; Oates, No. 930.

Not a common bird, and seems to be migratory. The young bird has the whole upper plumage with the feathers tipped black, and the

lower plumage the same, though not so distinct. These black tips are not discarded until the second year.

The nest is far more compact than is that of *P. nepalensis*. Hume says the eggs "are broad ovals, not nearly so spherical as those of *P. brachyura*, with a fair amount of gloss, but again by no means so glossy as those of the species just referred to." Now I have taken intensely glossy ones and very spherical ones; in fact, with the exception of one pair of eggs of *P. cucullata*, a clutch of eggs of *P. cyanea* now in my collection are the most glossy ones I have, as also the most spherical.

The eggs vary nearly as much as those of *P. nepalensis*; but, taking them all round, they are decidedly more richly marked, and the markings are certainly both darker and more numerous.

(373) *PITTA CUCULLATA*.—The Green-breasted Pitta.

Hume, No. 346; Oates, No. 935.

Not a common bird anywhere, and very irregularly distributed. Thus there is one little tiny stream in the north where I can always find a few, but there are none in the Diyung into which the Kuta, the small stream in question, runs; nor are there any on several of the other small streams in the immediate vicinity. Their loud musical whistle always denotes their whereabouts, but they are such shy birds and keep so much to fairly thick undergrowth that they are not often seen though often heard.

The spherical pair of eggs above alluded to measure $\cdot 95'' \times \cdot 92''$ and $\cdot 92'' \times \cdot 91''$; so it will be seen that it would not be easy to get any much more spherical than these.

The eggs average in richness of colouring, etc., much the same as those of *P. cyanea*; indeed all the smaller *Pittas* seem to lay eggs more handsomely and more profusely marked than does *P. nepalensis*.

ORDER—EURYLEMI.

Family *Eurylæmidæ*.

(374) *P. SARISOMUS-DALHOUSIÆ*.—The Long-tailed Broad-bill.

Hume, No. 138.

This beautiful Broad-bill is by no means uncommon above 2,000 feet, and from that height up to about 4,000 feet; above the latter and below the former it is not common, though I have met with it in the

plains on more than one occasion. I do not think, however, that it often breeds much below 2,000 feet.

The nest is like that described in "Nests and Eggs," Vol. II, page 289, and it is not necessary to add anything about it; but in North Cachar I have found this bird to lay three very distinct types of egg.

The first type is pure white, with numerous, rather large, boldly defined blotches of reddish-brown, with here and there a few secondary marks of pale purple.

The second type has the ground varying from pale to rather dark full cream with large and rather light reddish blotches, the secondary markings being the same as in the first type. In both types the blotches are generally fairly numerous everywhere, but more so towards the larger end, in a few eggs being almost confined to this.

The third type is pure unmarked white, and differs also from the others in being decidedly more glossy.

In shape the egg is normally rather a pointed oval, decidedly smaller at one than at the other end. I think also that the pure white eggs are more pointed than the others, and that the second type is less so than the first.

Twenty-four eggs of the first type average $1.15'' \times .73''$ full.

Thirty-two eggs of the second type average $1.1'' \times .72''$, and the only nine I have measured of the white ones average $1.12'' \times .73''$. Besides these nine, I have a clutch of five eggs, evidently the first clutch laid by the hen, for the smallest egg measures only $.80'' \times .62''$, and they gradually increase to $1.20''$ to $.80''$.

I have found in the stomachs of these birds cockroaches, small beetles, butterflies, grasshoppers, and many other kinds of insects, some amongst them being grubs and larvæ, evidently taken from the rough bark of trees, and this would infer that the birds sometimes feed clinging to the trunks and larger branches. I have seen them capture insects on the wing, and whilst thus engaged their actions reminded me of Drongo-shrikes, but they are heavier and slower.

It has a peculiar habit of settling on the end of some thin pendant bough and thence climbing slowly up, with head and tail close to the branch; and under these circumstances and at a little distance it has a very parrot-like aspect, heightened by the long tail and brilliant colouring.

SCRIOLOPHUS LUNATUS.—Gould's Broad-bill.

Hume, No. 139 Bis.

I am very doubtful about this bird, never having had a typical Burmese *S. lunatus* to compare with my skins. At present all I can say is that I have come across some half-dozen birds in these hills which differ from the normal plumage of *S. rubropygius* in that they have the forehead a pale grey, not contrasting with, but shading into, the dark grey of the occiput, and also have the hue of the nape decidedly brownish.

This, of course, agrees exactly with Sclater's diagnosis of *S. lunatus* as given in the British Museum Catalogue, Vol. XIV, page 460; but the colouring is so much a matter of degree that, without having a typical skin for purposes of comparison, I do not number this as being, without doubt, a Cachar bird.

Nearly all the birds I have seen with this plumage have been birds caught on the nest.

Both this and the eggs are exactly like that of the normal *S. rubropygius*.

(375) SCRIOLOPHUS RUBROPYGIUS.—Hodgson's Broad-bill.

Hume, No. 139.

This is a very common bird in North Cachar.

The nest of this bird is built on the same plan as that of *Psarismnus dallousiae*, but is far neater, smaller, and more compact. It is built of much the same kind of materials, but fewer twigs, sticks, and tendrils are used, and a good deal more grass and similar substances; moreover, in the inside as lining there are always placed a certain number of fresh leaves gathered from some evergreen plant, a lining which *P. dallousiae* more seldom goes in for; but, on the other hand, he invariably masses on the outside of his nest a comparatively vast tangle of small twigs, silk cocoons, excretæ of insects and other useless ornaments which *S. rubropygius* finds he can do without.

The positions chosen as sites for the nests are much the same, and on one occasion I found a nest of each species on the same tree; but I have never taken two nests of the red-backed bird from one tree.

It breeds from the level of the plains up to about 5,000 feet, perhaps even higher, but the majority below 3,000 feet.

The eggs, in number four to six or even seven, are white with a few black or black-and-purple spots scattered about all over the surface

of the egg, but more numerous towards the larger end. In some eggs the spots are rather paler, a brownish-purple; and one or two clutches I have seen have the ground-colour a pale delicate pink, with spots of purple-brown and secondary ones of lavender and grey, these latter often surrounding the darker ones as with a nimbus, but not making them look as if they had run.

The few specimens of this type in my collection all have the markings almost confined to the larger end, and even there not very numerous.

Taking the whole series I have seen—probably over a hundred—I should say that an equal number of eggs of very few other birds would show as little variation either in size, shape or coloration. Forty eggs average $\cdot 96'' \times \cdot 72''$, but I have kept no record of the largest and smallest eggs taken.

The shape is a broad oval, rather pointed. The texture is close and fine, shewing a slight gloss.

Far from being the bold bird as it is stated to be by Dr. Helfer (Jerdon), I have found it to be rather wild and shy, and that when frightened it often takes flight to some distance. When, however, it is in one of the deep shady nullahs to which it is so fond of resorting, it is often loathe to leave, and a flock, if followed up in such a place, may be almost exterminated before it will do so.

I have sometimes heard this bird uttering a low warbling note, rather a musical sound, and very different to the harsh "tin-kettly" cry which seems to be that most indulged in by this family.

The Cacharis assert that there is a third species of Broad-bill inhabiting these hills, and they describe a bird which would seem to be *Cymborhynchus macrochnehus*, though that bird is most unlikely to be found here. The Cacharis are, however, such close observers, some of them also such keen naturalists, that I think their report may have some foundation. They brought me a nest and eggs once belonging to this unknown bird, which corresponded in every detail, except as regards size, with the nests and eggs of *Psarisomus*, but they were much smaller.

ON NEW AND LITTLE-KNOWN *LEPIDOPTERA*
FROM THE INDO-MALAYAN REGION.

BY LIONEL DE NICÉVILLE, F.E.S., C.M.Z.S., &c.

(With Plates R, S, and T.)

(Read before the Bombay Natural History Society on 19th Sept., 1895.)

(Continued from page 40.)

Suborder RHOPALOCERA.

Family LYCÆNIDÆ.

19. *ARRHOPALA AUZEA*, n. sp., Pl. S, Figs. 29, ♂; 30, ♀.

HABITAT: Preanger, S.-W. Java.

EXPANSE: ♂, ♀, 2·4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining pale silvery-blue. *Forewing* with the costa as far as the subcostal nervure, the apex widely and the outer margin less widely, of a darker and more purple tint than the rest of the wing; the costa and outer margin very narrowly black. *Hindwing* with the costa somewhat widely fuscous; the abdominal margin, as far as the submedian nervure, whitish; the outer margin broadly but decreasingly to the anal angle of the same purple tint as the costa and outer margin of the forewing; the outer margin with a narrow anteciliary black line as in the forewing, within which, at the anal angle, are two narrow black spots divided by the submedian nervure; tail at the end of the first median nervule long, black, tipped with white; a short tooth-like projection at the termination of the submedian nervure. UNDERSIDE, *both wings* dull hair-brown; all the spots of a much darker shade of brown, outwardly prominently defined by a white line. *Forewing*, with all the veins more or less defined with white; the inner margin broadly whitish; a large round spot towards the base of the discoidal cell, a still larger one in the middle, a still larger again quadrate one at the end of the cell, its outer edge trifestooned; a large spot posterior to the costal nervure anterior to the middle spot in the cell; two spots beyond this, one above the other, anterior to the spot at the end of the cell and divided by the first subcostal nervule; a large spot at the base of the submedian interspace extending into the sutural area, joined to another large transverse spot placed at the base of the first median

nervule, also extending into the sutural area, a large spot filling the base of the first and a small spot filling the base of the second median interspace; a discal series of eight spots placed four and four, the anterior quartette placed strongly outwardly obliquely, increasing in size to the fourth spot which is the largest, the posterior quartette well removed inwardly from the lowest spot of the anterior quartette, arranged at right angles to the inner margin, the two lowest spots divided by the submedian nervure much smaller than the two spots anterior to them, the lowest spot of all the smallest of all; marginal and submarginal series of obscure oblong fuscous spots, the submarginal series the more prominent. *Hindwing* with a broad subcostal white fascia, outwardly extending a little on both sides of the two subcostal nervules; a large spot at the extreme base of the wing anterior to the costal nervure; four spots extending across the base of the wing, the anterior one posterior to the costal nervure very large; beyond and touching the last-named spot in the same interspace is a still larger spot; an oval spot in the middle of the cell, with a very large triangular one posterior to it in the submedian interspace; a very large triangular spot at the end of the cell, posterior to which is a spot at the base of the first median interspace; the discal series consists of six spots arranged in pairs, and a large hook-shaped marking which reaches from the first median nervule to the internal nervure; a submarginal and marginal series of markings as in the forewing; an oblong black spot on the margin in the first median interspace crowned with pale metallic blue scales; a larger marginal black spot in the submedian interspace sprinkled all over with blue scales; the anal lobe small, black, crowned with blue scales; a black anteciliary thread, defined on both sides with an equally fine white thread, anteriorly obsolete. **FEMALE.** **UPPERSIDE,** *both wings* differ from the male in having the black borders very broad. *Forewing* has the costal border reaching to the subcostal nervure, and giving off a black bar at the end of the cell, the area around which is whitish. Otherwise as in the male.

This species belongs to the group of *A. camdeo*, Moore, a North-East Indian species, from which the male is distinguished by the different shade of blue of the upperside without the whitish irroration in the middle of the forewing. The markings of the underside are very

different. It is also allied to *A. anarte*, Hewitson, from Nemotha (Cachar), Myitta (Burma), the Malay Peninsula, Borneo, and Makassar (Celebes), but that species lacks the broad subcostal white fascia on the underside of the hindwing present in *A. auzea*. It is perhaps nearest to "*Amblypodia*" *auvesia*, Hewitson,* but the male differs from that sex in having narrow instead of broad black margins to both wings on the upperside, and has no irrorated white patch in the middle of the forewing; the female differs in being of a much paler shade, more blue, less purple, with that colour far more extensive on the hindwing; on the underside the markings are smaller and well separated instead of being run together; *A. auvesia* is also a smaller insect. "*Amblypodia*" *anthore*, Hewitson,† is somewhat similar on the upperside, but the underside is quite different, having no costal white fascia to the hindwing. This feature is absent also in "*Amblypodia*" *acetes*, Hewitson,‡ and differs also in the hindwing on the upperside having the blue area even smaller than in *A. auvesia*. As far as I am aware, the white costal fascia on the underside of the hindwing is only found in *A. subfasciata*, Moore, from Burma, *A. auvesia*, Hewitson, from Sumatra, *A. auzea*, de Nicéville, from Java, and *A. tephlis*, Hewitson, from Gilolo.

Described from a single pair kindly sent to me by Herr G. Hoppenstedt.

20. *ARRHOPALA AZINIS*, n. sp., Pl. T, Fig. 31, ♂.

HABITAT: N.-E. Sumatra.

EXPANSE: ♂, 1.55 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* deep shining purple. *Forewing* with the costa narrowly black; outer margin rather broadly black (rather less than 2 mms.). *Hindwing* with the costa, outer and abdominal margins still more broadly black than in the forewing (about 3 mms.); anal lobe very small, black, tipped with white; tail rather short, black, tipped with white. UNDERSIDE, *both wings* dull hair-brown, almost plumbeous, all the markings very slightly darker than the ground-colour, with very narrow outer whitish margins;

* Ill. Diurn. Lep., *Lycanide*, p. 5, n. 10, pl. i, figs. 2, 3, male; 1, female (1863), from Sumatra.

† Cat. *Lycanide* B. M., p. 6, n. 25, pl. iii, figs. 21, 22, male (1862), from Batchian.

‡ Cat. *Lycanide* B. M., p. 5, n. 19, pl. iii, figs. 14, 15, female (1862), from Makassar, Celebes.

the usual submarginal fascia straight and rather prominent. *Forewing* with a small round spot towards the base of the discoidal cell, a larger transverse one across its middle, and a still larger one at its end; a small round spot above the latter on the costa; two indistinct ones below the cell divided by the first median nervule; a rather broad even slightly outwardly curved discal band, the uppermost spot of which is the smallest, the two lowermost spots in the submedian interspace darker than the rest, conjoined, forming a figure of 8; the inner margin broadly paler than the rest of the wing. *Hindwing* with the usual four round spots across the base, followed by three others, the middle one in the cell; a large spot closing the cell; an irregular discal band, its two uppermost portions in one straight line, the four following portions also in one straight line, but shifted outwardly towards the margin of the wing, the two posteriormost portions recurved to the abdominal margin; the small anal lobe deep black; a small oval spot on the margin in the first median interspace crowned with metallic green scales; the space between this latter spot and the anal lobe sprinkled with metallic green scales, anterior to which is a sprinkling of black and white scales; a white anteciliary thread prominent at the anal angle, obsolete about the middle of the margin.

This appears to be a very distinct species. On the upperside it is somewhat similar to the common *A. adorea, mihi*,* which occurs in Assam, Burma, the Malay Peninsula, and N.-E. Sumatra, from which it differs in its somewhat smaller size, darker purple coloration, and broader black borders. On the underside it is very near to *A. ace, mihi*,† from the Malay Peninsula, and N.-E. Sumatra, but the ground-colour is not quite so dark, and all the spots are smaller.

Described from a unique example in the collection of Hofrath Dr. L. Martin taken at Bekantschan in March, 1894.

21. *ARRHOPALA AZATA*, n. sp., Pl. T, Figs. 32, ♂; 33, ♀.

HABITAT: Perak, Malay Peninsula; Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, 1·9; ♀, 1·8 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* pale violet-blue, very similar in shade to that of *A. anarte* and *A. camdeo* as figured by

* Butt. of India, vol. iii, p. 238, n. 789, pl. Frontispiece, fig. 139, *male* (1890).

† Journ. Bomb. Nat. Hist. Soc., vol. vii, p. 329, n. 6, pl. H, fig. 13, *male* (1892).

Hewitson in Cat. *Lycaenidae* B. M., pl. iii, though somewhat darker. *Forewing* has the costa and outer margin most narrowly black. *Hindwing* has the apex as far as the first subcostal nervule fuscous, the outer margin most narrowly black, the abdominal margin broadly whitish; the anal lobe small, bearing a deep black spot almost hidden beneath turquoise-blue scales; outer tail from termination of first median nervule rather long, black, tipped with white; inner tail from termination of submedian nervule very short, tooth-like, black. **UNDERSIDE**, *both wings* pale shining hair-brown, all the markings of a deeper shade of brown than the ground, outwardly defined with whitish. *Forewing* with a circular spot towards the base of the discoidal cell, a reniform one across its middle, a quadrate one outwardly indented closing the cell, two large spots posterior to the cell divided by the first median nervule; a discal band of six (seven in Sumatran specimens) well rounded spots, the two (or three) lowermost ones shifted inwardly towards the base of the wing posterior to the third median nervule; a broad, rather prominent submarginal fascia. *Hindwing* with five round basal spots; an oval one in the middle of the cell, with one anterior and one posterior to it; a large spot at the end of the cell, with a small one posterior to it at the base of the first median interspace; a discal series of spots, the six anterior ones well rounded, placed in pairs, the two posterior ones elongated and recurved to the abdominal margin; a double series of marginal lunules; the anal lobe and oval spot on the margin in the first median interspace prominent, deep black, crowned with metallic turquoise-blue scales, the interspace between them also thickly sprinkled with similarly-coloured scales; an anteciliary black thread defined on both sides with white. **FEMALE**. **UPPERSIDE**, *both wings* pale violet-blue. *Forewing* with the costa and outer margin rather broadly (between 2 and 3 mms.) black, the spot closing the discoidal cell on the underside shewing through on the upperside, and defined on both sides with whitish. *Hindwing* with the costa and outer margin broadly black, but this black border is reduced to two narrow black spots towards the anal angle. **UNDERSIDE**, *both wings* as in the male.

I do not know any near ally to this species. It may be close to *A. vihara*, Felder, described from Malacca interior and recorded from Tenasserim and Nias, but that species appears to have in the male a

black border of uncertain width on the upperside, while *A. azata* cannot be said to have any black border at all. On the underside of the forewing as figured, *A. vihara* has only five spots in the discal band, and the inner margin is almost white, in *A. azata* there are six or seven discal spots, and the inner margin is but slightly paler than the rest of the wing; moreover, this band is even in *A. vihara*, broken in *A. azata*. The pale blue coloration of this species on the upperside in both sexes makes it a very easily recognised one.

Described from a male from Perak and one from Sumatra taken in July in my own collection, and a pair from the latter island taken in March and November in the collection of Hofrath Dr. L. Martin.

22. *ARRHOPALA ANILA*, n. sp.

Amolyptodia agesias, variety *a*, Hewitson, Cat. *Lycanidæ*, B. M., p. 11, n. 49 (1862); id., de Nicéville, Butt. of India, vol. iii, p. 273 (1890).

HABITAT: Perak; Rawan, Selangor (*December*)—both in the Malay Peninsula; N.-E. Sumatra; Borneo.

EXPANSE: ♀, 1.2 to 1.6 inches.

I have ventured to give this form a name. Hewitson described it from a female as a variety of *A. agesias*, Hewitson. I think it highly improbable that it is a variety. I now possess nine specimens of it, and have seen many more, and they are all alike, and agree in having no discal band on the forewing on the underside, while typical *A. agesias*, Hewitson, from Borneo, has the usual band consisting of five round spots as figured, though Hewitson only mentions four. Hewitson describes *A. agesias* and its variety from female specimens. All my specimens look like females, but I am doubtful as to their sex—they may be males. I do not describe the species here, as I have already done so at sufficient length on page 273 of vol. iii of "The Butterflies of India, Burmah and Ceylon."

23. *ARRHOPALA AVATHA*, n. sp., Pl. T, Fig. 34, ♂.

HABITAT: N.-E. Sumatra.

EXPANSE: ♂, 1.3 to 1.4 inches.

DESCRIPTION: MALE. UPPERSIDE, both wings dark shining purple, with a broad (a little more than 2 mms.) outer black border. Forewing with the costa very narrowly black, the outer margin rather more broadly black at the apex. Hindwing with the costa and abdominal

margin broadly black. **UNDERSIDE**, *both wings* dull hair-brown with a slight gloss in some lights; all the markings very indistinct, of the colour of the ground, outwardly defined by a pale line. *Forewing* with a round spot towards the middle of the discoidal cell; an oblong spot closing the cell; a discal almost straight band of five or six rounded spots; a very obscure submarginal fascia; the inner margin broadly paler than the rest of the wing. *Hindwing* with the usual four small round basal spots; a round spot in the middle of the cell, with a spot anterior to it on the costa; an oblong spot closing the cell; a large spot posterior to the cell in the submedian interspace; a somewhat regular discal band, of which the posterior of the two anterior spots is placed midway between the third spot of the discal series and the spot at the end of the cell; two indistinct marginal fasciæ; no anal lobe or tail, but at the anal angle there is on the outer margin an elongated narrow black spot anteriorly crowned with metallic turquoise-blue scales.

This species appears to be nearest to *A. davisonii*, *mili*,* from Burma, the Malay Peninsula, Sumatra, and Borneo, from which it may instantly be known by the black border on the upperside of the male being quite twice as broad. The markings of the underside are practically the same in both.

Described from five specimens in my collection, which do not differ at all. I would not have ventured to name it had I not found from the examination of perhaps a hundred specimens that *A. davisonii* is constant in the width of the black border on the upperside in the male. It is probably the present species that Mr. H. J. Elwes refers to when he wrote†:—"There seems to be considerable variation in the breadth of the border" of *A. davisonii*.

24. CAMENA CRETHEUS, de Nicéville, Pl. T, Fig. 35, ♀.

C. cretheus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 294, n. 24, pl. P, fig. 35, male (1895).

HABITAT: Battak Mountains, N.-E. Sumatra.

EXPANSE: ♀, 1.4 inches.

DESCRIPTION: **FEMALE**. **UPPERSIDE**, *both wings* dull pale blue without any gloss. *Forewing* with the base of the costa whitish; the

* Butt of India, vol. iii, p. 280, n. 845, pl. Frontispiece, fig. 135, male (1890), from Singapore.

† Proc. Zool. Soc. Lond., 1892, p. 633.

apex broadly black, this colour extending decreasingly along the costa till it meets the white area, also decreasingly along the outer margin, ending almost in a point at the anal angle. *Hindwing* with the basal half of the costa broadly white, the apex equally broadly black, the outer margin bearing a fine black anteciliary thread, defined inwardly by an equally fine white thread; an indistinct marginal round diffused black spot in the first median interspace; the anal lobe black, bearing anteriorly a small orange spot; abdominal margin broadly white. **UNDERSIDE**, *both wings* as in the male, except that the orange spot at the base of the costa of the *forewing* is less prominent than in the male, and the orange subanal area on the *hindwing* is more extensive, extending uninterruptedly to the abdominal margin, and reaching the discal line.

Described from a single example in my collection captured in March.

Genus CREUSA², nov.

MALE. **FOREWING**, triangular; *costa* regularly but slightly arched; *apex* acute; *outer margin* nearly straight; *inner angle* rounded; *inner margin* nearly straight, slightly emarginate in the middle; *costal nervure* ending opposite to the apex of the discoidal cell; *first subcostal nervule* arising a little nearer to the apex of the cell than to the base of the wing, close to its base anteriorly bowed forwards, and almost touching the costal nervure for some little distance; *second subcostal* arising about as far from the first subcostal as from the origin of the upper disco-cellular nervule; *third subcostal* short, arising much nearer to the apex of the wing than to the apex of the cell; *subcostal nervure* ending at the apex of the wing; *upper disco-cellular nervule* (this is actually the base of the upper discoidal nervule) stout, rather long, strongly outwardly oblique; *middle disco-cellular* straight, upright; *lower disco-cellular* also straight and upright, slightly longer than the middle disco-cellular; *second median nervule* arising well before the lower end of the cell; *first median* arising nearer the lower end of the cell than to the base of the wing, arising about twice as far from the second as the second does from the third; *submedian nervure* slightly sinuous; *secondary sexual character* consists of a large patch of modified deep black scales occupying nearly the outer half of the cell, and extending

slightly beyond it into the discoidal interspaces. HINDWING, *costa* greatly arched at base, thence straight to apex; *apex* well rounded; *outer margin* very nearly straight to the anal lobe; *tails* two, short, the anterior one from the termination of the first median nervule rather longer than the posterior one from the termination of the submedian nervule; *anal lobe* small; *abdominal margin* sinuous, excavated anterior to the anal lobe; *costal nervure* greatly arched at the base, thence straight to the apex of the wing; *first subcostal nervule* arched throughout its length, arising well before the apex of the cell; *discocellular* nervules of equal length, nearly straight, strongly outwardly oblique; *second median nervule* arising just before the lower end of the cell; *first median* arising nearer the lower end of the cell than the base of the wing; *submedian nervure* straight; *internal nervure* highly sinuous. *Antennæ* about half the length of the *costa* of the forewing, with a lengthened rather slender club. *Eyes* naked. *Palpi* naked, porrected forwards, the third joint not rising above the level of the top of the head. *Thorax* small. *Abdomen* not nearly reaching to the anal angle of the hindwing. FEMALE. WINGS somewhat broader than in the male. FOREWING, with no patch of androconia on the upperside. HINDWING, has the outer margin more rounded than in the male. Type, *C. culta*, de Nicéville.

Nearest to the genus *Ops*, de Nicéville,* with which it agrees very closely in outline and neuration, but differs from the three species included therein by its smaller size, and the character of the "male-mark," which in bleached specimens remains unaffected by the bleaching fluid, while in *O. ogyges*, de Nicéville, the type of the genus *Ops*, it entirely disappears when bleached; it also occupies a different position, as it does not extend anteriorly or posteriorly beyond the cell, being strictly bounded in those directions by the subcostal and median nervures.

25. CREUSA CULTA, n. sp., Pl. T, Figs. 36, ♂; 37, ♀.

HABITAT: Khasi Hills.

EXPANSE: ♂, 1·2 to 1·4; ♀, 1·3 inches.

DESCRIPTION: MALE. UPPERSIDE, both wings rich shining deep blue as in *Tajuria longinus*, Fabricius; *cilia* fuscous. Forewing with

* Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 296 (1895).

the costa as far as the subcostal nervure, the apex widely, the outer margin decreasingly black; a large oval plush-like jet-black patch of androconia at the end of the discoidal cell, outwardly extending just beyond it. *Hindwing* with the costa and apex broadly fuscous, the abdominal margin broadly pale fuscous, the outer margin with an anteciliary black thread; the anal lobe fuscous, with faint traces of a few ochreous and blue scales at the middle; tails fuscous, tipped with white. **UNDERSIDE**, *both wings* drab or pale slate colour, the disc crossed by a deeper drab narrow line outwardly faintly defined with whitish. *Forewing*, the inner margin broadly paler than the rest of the wing; the discal line is nearly straight, commences close to the costa and ends on the submedian nervure; there is a faint trace of a submarginal dark fascia. *Hindwing*, the discal line somewhat irregular, posteriorly zigzag and recurved to the abdominal margin; a rather small ochreous spot close to the margin in the first median interspace, and a similar one on the anal lobe, the latter bears outwardly a small patch of black and metallic turquoise-blue scales; the space between the two ochreous spots is faintly irrorated with black and white scales. *Thorax* above blue. *Abdomen* above fuscous, beneath drab. *Antennae* black, very slightly annulated with white, the club beneath ferruginous, at the tip wholly ferruginous. **FEMALE**. **UPPERSIDE**, *both wings* much paler blue with less gloss than in the male. *Forewing* with the base of the costa whitish, no androconal black patch, the apex less broadly black than in the male. Otherwise as in the male.

On the upperside the male at once reminds one of Hewitson's figure of the male of "*Iolais*" *isæus*, Hewitson,* which I identify with *Britomartis cleoboides*, Elwes,† but the blue coloration in that species is of a far paler and duller shade, and the apex of the hindwing is not broadly black. Mr. Hampson, however, informs me that the blue colour shewn in Hewitson's figure is incorrect, it should be darker, as in *Tajuria longinus*, Fabricius. It cannot, however, represent *C. culta*, as that species has three subcostal nervules to the forewing, while "*I.*" *isæus* has only two. On the upperside the female

* Ill. Diurn. Lep., *Lycaenidæ*, Supplement p. 10, Supplement pl. iv, figs. 35, 36, male (1869).

† Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 306, n. 1 (1895).

at once reminds one of Hewitson's figure of "*Iolaus*" *isceus*, Hewitson,* which name stands for the species, but the underside differs considerably, as it has a very large ochreous area at the anal angle of the hindwing, which area in *C. culta* is reduced to two small spots.

I am indebted to the Rev. Walter A. Hamilton for the gift of five males and one female of this interesting little species.

Genus CREON, nov.

MALE. FOREWING, triangular, broad ; *costa* arched at base, straight in the middle, deflected posteriorly at the apex ; *apex* acute ; *outer margin* strongly convex ; *inner angle* rather acute ; *inner margin* much bowed posteriorly in the middle, to the edge of this bowed portion are attached two pencils of hairs, the interior one is narrow, long, deep black, directed obliquely outwardly, under and forwards, and extends a little beyond the submedian fold ; the exterior one is broad, short, and pale ochreous ; *costal nervure* ending opposite to the apex of the discoidal cell ; *first subcostal nervule* arising nearer to the apex of the cell than to the base of the wing, well separated from the costal nervure ; *second subcostal* arising twice as far from the upper discocellular as from the first subcostal nervule ; *third subcostal* short, arising much nearer to the apex of the wing than to the apex of the cell ; *subcostal nervure* ending at the apex of the wing ; *upper discocellular nervule* (this is actually the base of the upper discoidal nervule) stout, rather long, strongly outwardly oblique ; *middle disco-cellular* very slightly concave, upright ; *lower disco-cellular* straight, in the same straight line with and rather longer than the middle discocellular ; *second median* nervule arising well before the lower end of the cell ; *first median* arising nearer the lower end of the cell than to the base of the wing, arising about twice as far from the second as the second does from the third ; *submedian nervure* slightly sinuous. HINDWING, *costa* greatly arched at base, thence to apex forming a very obtuse angle, the two sides forming this angle of nearly equal length, each side almost straight ; *apex* well rounded ; *outer margin* at first slightly concave, produced from the apex of the second median nervule to the anal lobe ; *tails* two, short, the anterior one from the termination of the first median nervule rather longer than the posterior one

* Ill. Diurn. Lep., *Lycenidæ*, p. 44, n. 15, pl. xix, figs. 13, 14, male (1865).

from the termination of the submedian nervure; *anal lobe* rather small; *abdominal margin* excavated anterior to the anal lobe, then greatly convex to the base of the wing; *costal nervure* short, much arched at base, arched again in the middle; a small round deep black patch of *androconia* on the upperside in the middle of the subcostal interspace, well separated from the veins on either side of it, placed in a line with the base of the upper disco-cellular nervule; *first subcostal nervule* arched throughout its length, ending at the apex of the wing, arising well before the apex of the cell; *upper disco-cellular nervule* nearly straight, strongly outwardly oblique; *lower disco-cellular* also straight, not so strongly outwardly oblique as the upper disco-cellular, of the same length; *third median nervule* much arched throughout its length; *second median* arising immediately before the lower end of the cell; *first median* arising nearer the lower end of the cell than the base of the wing, arising about twice as far from the second as the second does from the third; *submedian nervure* straight; *internal nervure* short, bowed outwardly close to its base. *Antennæ* about half the length of the costa of the forewing, with a lengthened rather slender club. *Eyes* naked. *Palpi* naked, porrected forwards, the third joint not rising above the level of the top of the head. *Thorax* small. *Abdomen* not nearly reaching to the anal angle of the hindwing. **FEMALE.** WINGS, broader than in the male. FOREWING, *inner margin* instead of being bowed out as in the male is emarginate in the middle, and has no tufts of hair attached to its edge and turned under and forwards as in the male. HINDWING, costa regularly and evenly arched throughout its length; *costal nervure* long, ending at the apex of the wing, in the male it is short, and the first subcostal nervule ends at the apex; no androconal patch of modified scales in the subcostal interspace. Otherwise as in the male. Type, *C. cleobis*, Godart.

This genus is allied to *Camena*, Hewitson, but differs in its male secondary sexual characters. In the forewing it has two (instead of one) tufts of hair attached to the inner margin, which is a unique feature in the *Lycœnidæ* as far as I am aware; and the androconal patch on the hindwing is very much smaller, being confined to the middle of one interspace, instead of extending into several interspaces as in *C. ctesia*, Hewitson (the type of *Camena*), and *C. deva*, Moore (the type of

Pratapa, Moore). The hindwing is also more bowed forwards in the middle, forming there an obtuse angle, and is more produced in the anal region from the lobe to the second median nervule than in those species.

(1) CREON CLEOBIS, Godart.

Polyommatus cleobis, Godart, Enc. Méth., vol. ix, p. 634, n. 61 (1823); *Iolaus cleobis*, Hewitson, Ill. Diurn. Lep., p. 43, n. 12, pl. xviii, figs. 8, 9, male; 10, female (1865); *Pratapa cleobis*, de Nicéville, Journ. A. S. B., vol. liv, pt. 2, p. 49, n. 91 (1885); id., Hampson, Journ. A. S. B., vol. lvii, pt. 2, p. 360, n. 145 (1888); *Camena cleobis*, de Nicéville, Butt. of India, vol. iii, p. 343, n. 399 (1890); *Amblypodia hypatada*, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 45, n. 72 (1857); *Dipsas biocellatus*, Grose, MS., Cat. Lep. Mus. E. I. C., vol. i, pl. xii, fig. 2, larva; 2a, pupa (1857).

HABITAT: Masuri in the Western Himalayas, Bholahât in the Malda district, Dinajpur, Jalpaiguri, Western Duars, Calcutta, Sibsagar in Upper Assam, Chin Lushai Hills, Ruby Mines in Upper Burma, Nilgiri Hills.

26. *TAJURIA THRIA*, n. sp., Pl. T, Figs. 38, ♂; 39, ♀.

HABITAT: Daunat Range, Middle Tenasserim, Burma; Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, 1.25 to 1.35; ♀, 1.20 inches.

DESCRIPTION: MALE. **UPPERSIDE**, *forewing* black, with a slight gloss in some lights. *Hindwing* with the costa as far as the costal nervure whitish; the apex and outer margin narrowly and decreasingly black, towards the anal angle this black margin is reduced to an anteciliary thread, posteriorly inwardly defined by an equally fine white thread; the abdominal margin as far as the submedian nervure broadly whitish, outwardly becoming blackish; the rest of the wing glittering azure; anal lobe black, bearing anteriorly a few blue scales; tails black with white tips, the outer one from the termination of the first median nervule the longer, the inner one from the termination of the submedian nervure inwardly ciliated with white. **UNDERSIDE**, *both wings* dull chrome-yellow; with a discal narrow darker line outwardly defined with whitish. *Forewing* has the discoidal cell closed by a pair of darker lines; the discal line is outwardly bowed, it commences at the costa and ends on the submedian nervure; there is a very obscure submarginal fascia; the inner margin broadly pale. *Hindwing* has the discal band from the costa to the second median nervule straight, then zigzagged to the abdominal margin; the outer margin

far as the discal line and from the anal angle to the third median nervule, anterior to which but not quite reaching the apex of the wing it is continued in a narrow submarginal fascia, white sprinkled with black scales, inwardly bearing a narrow lunular black line; the anal lobe bears a large round deep black spot anteriorly with a few metallic pale green scales; a large oval deep black spot in the first median interspace near the margin; a fine black anteciliary thread, defined on both sides with an equally fine white thread. *Cilia* cinereous throughout. FEMALE. UPPERSIDE, *forewing* black; with a broad pale blue area from the inner margin to the median nervule, extending slightly into the first median interspace, but not nearly reaching the outer margin. *Hindwing* with the costa and apex broadly black, the outer margin rapidly decreasingly black; the rest of the wing pale blue. Otherwise as in the male.

This interesting little butterfly belongs to a small but distinct group which hitherto has comprised three Northern Indian species, its geographical range extending from Masuri in the Western Himalayas to Assam, viz.:—*T. megistia*, Hewitson, *T. yajna*, Doherty, and *T. istroidea*, de Nicéville. From all of these *T. thria* may be known in the male in the hindwing being almost entirely cerulean blue, the others having this colour confined to a more or less wide anterior patch. In the same way the female may be known by the blue area in the hindwing on the upperside being of much greater extent, and almost reaching the outer margin, which is not the case in the three above-named species. The coloration of the underside of *T. thria* agrees with that of *T. megistia*, being orange or dull chrome-yellow.

Described from several males in the collection of Hofrath Dr. L. Martin and my own, taken in March and May, and a solitary female in Dr. Martin's collection, taken in July, 1894, all from the Battak Mountains, and from five males from the Daunat Range, Middle Tenasserim, Burma, in my own collection. The type specimens are from Sumatra.

27. RAPALA RHÆCUS, de Nicéville, Pl. T, Fig. 40, ♀.

R. rhæcus, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. ix, p. 319, n. 35, pl. P, fig. 47, male (1895).

HABITAT: N.-E. Sumatra.

EXPANSE: ♀, 1.5 to 1.6 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* fuscous, with a distinctly reddish-coppery gloss in some lights which is particularly

prominent on the veins. *Cilia* reddish-coppery. *Forewing* with the basal half iridescent dark ultramarine-blue visible in all lights, but much brighter in some lights than in others, anteriorly bounded by the subcostal nervure, posteriorly by the inner margin, outwardly reaching beyond the discoidal cell, and approaching the outer margin at the anal angle. *Hindwing* with the discal two-thirds blue as in the forewing, leaving the costa, outer and abdominal margins about equally broadly fuscous; anal lobe black, anteriorly bearing a few turquoise-blue scales, inwardly with a small reddish patch. **UNDERSIDE**, *both wings* as in the male, except that the discal fuscous band is outwardly defined by a whitish thread.

I possess examples of this sex taken in the Battak Mountains in March and July, and at Bekantschan in March.

28. *RAPALA RHODOPIS*, n. sp., Pl. T, Figs. 41, ♂; 42, ♀.

HABITAT: Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, 1.3 to 1.4; ♀, 1.3 inches.

DESCRIPTION: **MALE**. **UPPERSIDE**, *both wings* shining fuscous. *Forewing* with the posterior outer end of the discoidal cell, the base of the second and first median, and all except a small portion exteriorly of the submedian and internal interspaces shining deep brownish-ferruginous of a very unusual shade; the bases of the three median nervules and that portion of the median nervure between the origins of the first and third median nervules defined with black, that is to say, the wing-membrane at these points is free from brownish-ferruginous scales. *Hindwing* with the costa widely as far as the discoidal nervule, and the outer margin somewhat narrowly of the black ground-colour, the abdominal margin pale fuscous, all the rest of the wing shining deep brownish-ferruginous; tail black, tipped with white; anal lobe black, anteriorly ochreous, with a narrow outer white line. **UNDERSIDE**, *both wings* pale brown distinctly glossed with dull yellow; the disco-cellular nervules defined by a narrow whitish and dark brown double line; a discal narrow dark brown line outwardly defined with whitish. *Forewing* has the discal line very straight and even, being only very slightly outwardly bowed, commencing at the subcostal nervure and ending on the submedian nervure; the tuft of hairs attached to the inner margin towards the base of the wing and turned under and forwards large and deep black. *Hindwing* has the discal line nearly

straight from the costa to the first median nervule, thence zigzagged to the abdominal margin, this latter portion is ochreous, and bears on each side a very fine black and an outer white line; the usual round black spot in the first median interspace faintly crowned with orange; the submedian interspace between the discal line and the margin irrorated with turquoise-blue scales; the anal lobe deep black crowned by a silvery-blue spot; anterior to the lobe is a short silvery-blue fascia. *Cilia* black, with an anteciliary white line on the anal half of the wing. FEMALE. UPPERSIDE, *both wings* shining dark hair-brown somewhat tinted with ochreous. *Forewing* with the costa widely extending well into the discoidal cell and the outer margin less widely fuscous. *Hindwing* has the anal lobe deep black inwardly bearing a small ochreous spot, outwardly defined by a narrow white line, which line is continued along the outer margin as far as the discoidal nervule, and is inwardly defined by a very thin black and then a white line; tail black, tipped with white. *Cilia* of the hindwing anally black, anteriorly and in the forewing dull ochreous. UNDERSIDE, *both wings* as in the male, except that the ground-colour is paler, being of a distinctly greenish-ochreous shade.

I do not know any species, except *R. rhoda*, de Nicéville, next described, to which the present species is allied, the coloration of the upperside of the male being quite unique. On the underside of both sexes the coloration and markings are very similar to those of *R. xenophon*, Fabricius, which is also found in N.-E. Sumatra.

Described from several males in Hofrath Dr. L. Martin's collection and my own taken in the Battak Mountains in March, May, July, August, September, and December, and a single female in Dr. Martin's collection, without date; also one male from Selesseh.

29. RAPALA RHODA, n. sp., Pl. T, Figs. 43, ♂; 44, ♀.

HABITAT: Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, ♀, 1.4 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining fuscous. *Forewing* with two longitudinal shining deep brownish-ferruginous streaks of a slightly darker shade than in *R. rhodopis*, de Nicéville, described above, commencing at the base of the wing, not quite reaching the outer margin; the anterior one posterior to but lying against the median nervure, occupying the whole basal portion of the

first median interspace, and extending slightly into the interspaces exterior and posterior to it ; the posterior one lying along both sides of the submedian nervure. *Hindwing* with the costa, outer and abdominal margins alone fuscous, the rest of the wing shining deep brownish-ferruginous ; the anal lobe ferruginous ; the tail black, tipped with white. **UNDERSIDE**, *both wings* dull fuscous ; two rather widely separated narrow whitish lines at the end of the discoidal cells ; a somewhat broad catenulated discal band of a slightly darker shade than the ground, outwardly defined on both sides by a very fine white line. *Forewing* has the discal band straight, commencing close to the costa, ending on the submedian nervure ; the tuft of hairs attached to the inner margin towards the base of the wing and turned under and forwards small and pale fuscous. *Hindwing* has the discal band very irregular, posteriorly recurved to the abdominal margin ; the usual round deep black spot slightly crowned with ferruginous in the first median interspace ; the submedian interspace between the discal band and the outer margin slightly irrorated with black and white scales ; the anal lobe deep black crowned with ferruginous and white ; anterior to the lobe is a short outwardly ferruginous, then black, and then white fascia ; the usual fine black anteciliary line inwardly defined by a fine white line from the anal angle to about the middle of the wing. **FEMALE**. **UPPERSIDE**, *both wings* shining fuliginous. *Hindwing* with the anal lobe as in the male. **UNDERSIDE**, *both wings* whitey-brown, the disco-cellular markings and discal band as in the male but more prominent ; an indistinct submarginal lunulated fascia.

Nearest to *R. rhodopis*, de Nicéville, described above, but differing greatly in details, though superficially very similar.

Described from a single pair in the collection of Hofrath Dr. L. Martin taken in the Battak Mountains in February, 1894.

30. *RITRA AUREA*, Druce, Pl. T, Fig. 45, ♀.

Sithon aurea, Druce, Proc. Zool. Soc. Lond., 1873, p. 352, n. 12, pl. xxxiii, fig. 1, male.

Ritra aurea, de Nicéville, Butt. of India, vol. iii, p. 411 (1890).

HABITAT : Borneo (*Druce*) ; Perak (*de Nicéville*) ; N.-E. Sumatra.

EXPANSE : ♀, 1.7 inches.

DESCRIPTION : **FEMALE**. **UPPERSIDE**, *forewing* dull dark ferruginous ; the base dusted with fuscous ; the apex widely and the outer margin decreasingly fuscous. *Hindwing* fuscous, the middle of the wing

obscurely ferruginous, of a duller shade than in the forewing; three outer discal pure white spots, the one in the submedian interspace square, the one in the first median interspace lunular, the one in the second median interspace elongated and the smallest of all; these three spots have beyond them close to the margin three other elongated white spots, with a fourth anteriorly on the excavation above the anal angle; the anal lobe black, bearing a few turquoise-blue metallic scales; the tails black broadly ciliated with white. *Cilia* of the forewing cinereous, of the hindwing broad and pure white. **UNDERSIDE**, *both wings* as in the male, except that the ground-colour is somewhat paler.

The coloration of the specimen above described reminds one of the female of "*Myrina*" *orpeus*, Felder, the male of which is figured by Hewitson as "*Myrina*" *massiva*,* a species from the Philippines, but the female of *R. aurea* differs from the same sex of that species on the upperside of the hindwing in having seven white spots in all instead of four only.

I possess two males of this interesting species from Sumatra, one taken at Selesseh on 14th April, 1894. The female here described from Sumatra is unique in the collection of Hofrath Dr. L. Martin.

Family PAPILIONIDÆ.

Subfamily PAPILIONINÆ.

31. PAPILIO (*Dalchima*) SARPEDON, Linnaeus, Pl. T, Fig. 46, ♂.

P. sarpedon, Linnaeus, Syst. Nat. Ins., ed. x, p. 461, n. 14 (1758); *P. sarpedon*, var., Leech, Trans. Ent. Soc. Lond., 1889, p. 115, n. 69, pl. vii, fig. 2, male; *P. (Dalchima) sarpedon*, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. viii, p. 54, n. 14, pl. L, fig. 11, male (1893); *P. sarpedon*, var. *semifasciatus*, Honrath, Ent. Nach., vol. xiv, p. 161 (1888).

I have already (l. c.) figured and described a very remarkable aberration or "sport" of *P. sarpedon* from the Battak mountains of N.-E. Sumatra, in which the normal discal blue-green band of both wings has entirely disappeared, except the anterior spot of the forewing which alone remains, and two of the normal number of six submarginal blue-green lunules (one from either end of the series) of the hindwing are also wanting. Mr. J. H. Leech (l. c.) has figured and described another remarkable form, which he says is the common one there, from Kiukiang in Central China, in which the normal discal blue-green band is wanting in the hindwing (the whitish spot in continuation thereof

* Ill. Diurn. Lep., p. 30, n. 8, pl. xvi, fig. 45, female; pl. xii, figs. 10, 11, male (1863).

anterior to the subcostal nervure is, however, present), and the posteriormost of the submarginal blue-green lunules of the hindwing is also absent. Herr E. G. Honrath (l. c.) has described this form from Kiukiang in Central China as *P. semifasciatus*. Lastly, to complete the series, I have here figured a male example from Sikkim in my collection, in which the blue-green band of the forewing on the upperside is reduced to the anteriormost and posteriormost spots, the latter, instead of being large, quadrate, and filling the interspace from the submedian nervure to the inner margin, is represented by an irregular small irrorated patch of blue scales heavily oversprinkled with black scales. On the underside of the forewing the discal band is faintly indicated by an indistinct bluish-white fascia in the normal position, which shows through on the upperside faintly by transparency, the anteriormost and posteriormost spots being present as on the upperside; on the hindwing this fascia is much paler than usual, and ends anteriorly on the subcostal nervure instead of extending broadly up to the costa. In other respects this specimen is normal.

Family HESPERIIDÆ.

32. TAGIADES TOBA, n. sp., Pl. T, Fig. 47, ♂.

HABITAT : Selesseh and the Battak Mountains, N.-E. Sumatra.

EXPANSE : ♂, 1.35 to 1.40 inches.

DESCRIPTION : MALE. UPPERSIDE, *both wings* deep black. *Forewing* with the following transparent white dots :—Two placed outwardly obliquely towards the outer end of the discoidal cell, the lower one sometimes missing; a costal one placed between the costal nervure and first subcostal nervule in a straight line with the dots in the cell; one in the second median interspace; and five subapical forming a perfect S-shaped figure. *Cilia* fuscous. *Hindwing* with the anal angle broadly, as far as the second median nervule, pure white, bearing a large round black spot on the margin in the submedian interspace, and a small one in the first median interspace; a fine black anteciliary line in the white area. *Cilia* anteriorly fuscous, posteriorly and along the abdominal margin pure white; very long at the anal angle. UNDERSIDE, *both wings* dull black. *Forewing* with the dots as on the upperside; a pale suffused indistinct twinned spot towards the outer angle in the submedian interspace. *Hindwing* almost entirely white, the costa and apex broadly and a narrow

anteciliary line alone being of the dull black ground-colour; the posterior edge of the blackish area bearing four rounded deep black spots; the two black spots on the outer margin as on the upperside. *Palpi* above, *thorax* and *abdomen* above black, but the latter tipped with white. *Palpi* beneath, *thorax*, *legs*, and *abdomen* beneath pure white.

Near to *T. lavata*, Butler, from Malacca (*Butler*), and Perak (*Dis-tant*), known to me by figures and descriptions only, from which *T. toba* differs in having two or three discal as well as the subapical dots in the forewing; the hindwing differs in the white area on both upper- and undersides being spotted with black, in *T. lavata* it is immaculate; the hindwing also appears to be conspicuously narrower and produced anally. It is also near to *T. gracilentus*, Weymer,* from New Britain (*Weymer*), but that species has the white area on the upperside of the hindwing at least twice as large as in *T. toba*, and the anteciliary line is developed into a broad band which includes the two black marginal spots of *T. toba*. The shape of the wings will also distinguish *T. toba* from the common and widely-distributed *T. atticus*, Fabricius, the hindwing in especial being much longer and narrower.

Described from several examples in the collection of Hofrath Dr. L. Martin and my own taken in March, April, and October.

33. KORUTHAIALOS KERALA, n. sp., Pl. T, Fig. 48, ♂.

HABITAT: Perak, Malay Peninsula; Battak Mountains, N.-E. Sumatra.

EXPANSE: ♂, 1.75 to 1.90; ♀, 1.75 to 2.15 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* shining fuscous. *Forewing* with a broad oblique discal orange fascia exactly as in *Kerana armatus*, Druce, that is to say, the band is about twice as long as it is broad, and it does not quite reach the costa, the outer margin at the anal angle, or the inner margin; but it differs slightly in form from the band in that species as its inner edge anteriorly is obliquely cut off instead of being continued straight to the costa. *Hindwing* unmarked. UNDERSIDE, *both wings* paler than on the upperside, of a more sooty brown. *Forewing* has the discal band rather broader than on the upperside, reaching the inner margin; it is paler moreover throughout, especially so posteriorly. *Hindwing* immaculate. *Cilia* fuscous throughout. *Antennæ* black, the apex of the club paler beneath.

* Stet. Ent. Zeit., vol. xlviii, p. 14, n. 12, pl. ii, fig. 7, male (1887).

Palpi fuscous, blunt, the third joint hidden beneath the second. *Body* and *legs* entirely fuscous. FEMALE, exactly like the male.

On the upperside this species has a strong superficial resemblance to *Celaenorrhinus ladana*, Butler, from Borneo (*Butler*), and Perak (*Elwes*), but on the underside that species has the hindwing spotted instead of immaculate. It is also very similar to *Kerana armatus*, Druce, from Borneo (*Druce*), Malacca and Singapore (*Distant*), Perak and Sumatra (*coll. de Nicéville*), but that species has the hindwing much broader (nearly circular), being as broad as it is long, while in *K. kerala* it is longer than broad; besides which *K. armatus* has in the male on the upperside of the hindwing "a patch of appressed scales occupying the entire discoidal cell, and giving it a velvety appearance," and on the underside of the forewing (Capt. Watson in Proc. Zool. Soc. Lond., 1893, p. 115, inadvertently says on the hindwing) "a similar ill-defined patch towards the base," these male secondary sexual characters being absent in *K. kerala*, that species possessing instead a pencil of stiff hairs on the base of the costa of the hindwing, correlated with a hairy groove at the base of the discoidal cell of the forewing on the underside within which the pencil of hairs appears to lie. It is probably nearest of all to "*Astictopterus*" *xanites*, Butler, described from Borneo, but that species is smaller (Watson says it expands 41 mms. = 1.6 inches), nor are the published figures of it by Butler and Distant at all like the present species, but it is almost certain that these figures were not taken from or are conspecific with the type.

Described from a female from Perak, and four males and two females from Sumatra, one taken in May, in my collection. Hofrath Dr. L. Martin possesses other specimens from Sumatra in his collection. The specimen figured is from Sumatra.

34. KORUTHAIALOS KOPHENE, n. sp., Pl. T, Figs. 49, ♂; 50, ♀.

HABITAT: N.-E. Sumatra; Central and Western Java.

EXPANSE: ♂, 1.6; ♀, 1.8 and 2.1 inches.

DESCRIPTION: FEMALE. UPPERSIDE, *both wings* sooty-brown. *Forewing* with a broad oblique discal orange fascia (not as broad as in *Celaenorrhinus ladana*, Butler, *Kerana armatus*, Druce, and *Koruthaialos kerala*, de Nicéville) commencing near the costa, ending near the submedian nervure, its edges irregular, crossed by the dark brown

veins, bearing a dark brown line which defines the disco-cellular nervules. *Hindwing* unmarked. **UNDERSIDE**, *both wings* rather paler than above. *Forewing* with the discal band broader and paler, especially posteriorly, than on the upperside, the disco-cellular dark line narrower and more prominent; the inner margin as far as the submedian nervure pale ochreous. *Hindwing* unmarked. *Antennæ* black, the apex of the club beneath paler. *Palpi* blunt, the third joint hidden beneath the second. *Body* and *legs* sooty-brown. **MALE**. Similar to the female but smaller, the orange fascia on both sides of the forewing rather more obscure and narrower. It has the same secondary sexual characters as in *K. kerala*, de Nicéville, described above.

Unfortunately I possess only four examples of this species. The type female is from Central Java, 1,500 feet, taken in 1891 by Herr H. Frushtorfer, and I have another female from Sukabumi, 2,000 feet, Western Java, captured by the same gentleman in 1893. They are larger than my other female specimen from N.-E. Sumatra, and have the discal band somewhat broader and less interrupted by the veins, but are obviously the same species. There are other specimens from Sumatra in Hofrath Dr. L. Martin's collection and the type male in my own collection. At first I believed this species to be the female of *K. kerala*, but subsequently I received both sexes of both species, which enables me to describe it. The female specimen figured is from Central Java, the male from Sumatra.

35. *AMPITTIA MAROIDES*, n. sp., Pl. T, Fig. 51, ♂.

HABITAT : Daunat Range, Tenasserim.

EXPANSE : ♂, 1.0 inch.

DESCRIPTION : **MALE**. **UPPERSIDE**, *both wings* glossy fuscous, with rich chrome-yellow markings. *Forewing* with a broad basal fascia occupying the whole of the discoidal cell and divided from the costa only by a fine thread of the ground-colour; two well separated discal quadrate patches, the anterior one crossed by the terminal portion of the subcostal nervure (the fifth subcostal nervule of some writers), and the fourth subcostal nervule, the posterior one crossed by the second median nervule, with a minute dot placed posteriorly against the middle of the lower of these two last-named spots in the submedian interspace; a streak of large highly deciduous chrome-yellow scales from the

base to about the middle of the submedian interspace, and a slightly longer similar one in the sutural area. *Hindwing* with a large chrome-yellow patch in the middle of the disc; the base with long chrome-yellow setæ. *Cilia* of the hindwing almost entirely chrome-yellow, of the forewing chrome-yellow of a duller shade mixed with black.

UNDERSIDE, *forewing* black; a costal chrome-yellow streak, which is joined to a wide similar streak occupying the outer two-thirds of the cell, both joined to the anterior discal patch of the upperside; the lower discal patch as on the upperside, but composed of two portions only, with no third minute portion in the submedian interspace; the apex of the wing more or less chrome-yellow; a fine anteciliary chrome-yellow line. *Hindwing* chrome-yellow, with numerous small black spots scattered evenly over the surface; a fine black anteciliary thread. *Antennæ* above black, beneath chrome-yellow. *Thorax* and *abdomen* above black, beneath and *legs* chrome-yellow.

Very near to *Ampittia maro*, Fabricius = *Cyclopides camertes*, Hewitson = *Thymelicus palemonides*, Snellen,* from Indian and Ceylonese specimens of which of the same sex it differs on both sides of the forewing in lacking the chrome-yellow spot in the middle of the submedian interspace, and on the underside in the ground-colour of the forewing being much deeper black, and all the spots of the hindwing being deep black, and consequently much more prominent. The cilia of the hindwing is also almost entirely chrome-yellow, instead of prominently spotted with fuscous at the termination of all the veins. It is but distantly allied to *Taractrocera atropunctata*, Watson, MS. from Upper Burma, the type specimens of which are before me as I write, and which has in the male all the chrome-yellow markings of the upperside very greatly reduced in size. In this species the knob to the antennæ is large and spatulate with no terminal crook, in *A. maro* the knob is smaller and elongated with a very small crook, in *A. maroides* the crook is distinctly longer.

Described from three examples in my collection.

Suborder HETEROCERA.

Family PYRALIDÆ.

Subfamily CHRYSAUGINÆ.

Genus TERATOMORPHA, nov.

* Reise en Midden-Sumatra, vol. iv, pt. 4, p. 28, n. 1 (1834).

PALPI upturned, the second joint reaching vertex of head and moderately scaled in front, the third short and naked. MAXILLARY PALPI absent. FRONS rounded. ANTENNÆ almost simple. LEGS, tibiae with the outer spurs about two-thirds the length of inner. FOREWING, with the *costa* arched at base and excised beyond middle; the *apex* bent upwards, arched and falcate; the *outer margin* excised below apex, produced and hooked at middle, then excised to outer angle; the *inner margin* lobed. MALE with large costal glandular swelling clothed with long hair at base on underside. Vein 3 from before angle of cell; 4 and 5 from angle; 6 from upper angle; 7, 8, 9 stalked and curved; 10, 11 free. HINDWING, with the *outer margin* somewhat excised below apex and angled at vein 2; vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle, 7 anastomosing slightly with 8.

This very distinct genus is the fourth belonging to the *Chrysauginae* known from the Oriental region (*Banepa*, Moore, *Omphalotomia*, Swinhoe, and *Macna*, Walker = *Goossensia*, Rogonot). The true habitat of *Hypocosmia definitalis*, Rogonot, described from Ceylon, being Venezuela. Of the other genera of the subfamily, one is Australian, whilst the numerous remaining genera are all from the Neotropical and the warmer parts of the Nearctic regions.

36. TERATOMORPHA HAMPSONII, n. sp., Pl. T, Figs. 52, ♂; 52a, neuration; 52b, head, showing palpi and antennae $\times 2$.

HABITAT: Daunat Range, Tenasserim.

EXPANSE: 32 mms. Type in B.M.

DESCRIPTION: MALE. Head dark vinous-red; thorax and abdomen fuscous. Forewing dark sap-green; the base and costal area dark vinous-red; a large vinous-red disco-cellular reniform spot conjoined to the red costal area, extending below vein 2 and enclosing a green spot at its upper exterior edge; the outer area suffused with vinous-red-brown scales. Hindwing fuscous-brown; the inner area smoky-black; the cilia reddish. UNDERSIDE, both wings fuscous-brown. Forewing with the outer area vinous-red. Hindwing with indistinct pale sinuous submarginal line.

It gives me great pleasure to name this interesting moth after my friend Mr. G. F. Hampson of the British Museum, whose important work on "The Moths of India" in the Fauna of British India series should be in the hands of every one interested in the *Heterocera*.

FIG. 34.	<i>Arrhopala avatha</i> , n. sp.	...	...	...	♂, p. 174
„ 35.	<i>Camena cretheus</i> , de Nicéville	...	...	...	♀, p. 175
„ 36.	<i>Creusa culta</i> , n. sp.	...	...	...	♂, p. 177
„ 37.	„ „ „	...	...	...	♀, p. 177
„ 38.	<i>Tajuria thria</i> , n. sp.	...	...	...	♂, p. 181
„ 39.	„ „ „	...	...	...	♀, p. 181
„ 40.	<i>Rapala rhæus</i> , de Nicéville	...	...	...	♀, p. 182
„ 41.	„ <i>rhodopis</i> , n. sp.	...	...	...	♂, p. 183
„ 42.	„ „ „	...	...	...	♀, p. 183
„ 43.	„ <i>rhoda</i> , n. sp.	...	...	...	♂, p. 184
„ 44.	„ „ „	...	...	...	♀, p. 184
„ 45.	<i>Ritra aurea</i> , Druce	...	...	...	♀, p. 185
„ 46.	<i>Papilio (Dalchina) sarpedon</i> , Linnæus	...	...	...	♂, p. 186
„ 47.	<i>Tagiades toba</i> , n. sp.	...	...	...	♂, p. 187
„ 48.	<i>Koruthaiatos kerala</i> , n. sp.	...	...	...	♂, p. 188
„ 49.	„ <i>kophene</i> , n. sp.	...	...	...	♂, p. 189
„ 50.	„ „ „	...	...	...	♀, p. 189
„ 51.	<i>Ampittia maroides</i> , n. sp.	...	...	...	♂, p. 190
„ 52.	<i>Teratomorpha hampsonii</i> , n. sp.	...	...	...	♂, p. 192

NEW AND LITTLE-KNOWN SPECIES OF INDO-MALAYAN
HYMENOPTERA, WITH A KEY TO THE GENERA
 OF INDIAN *POMPIDIDÆ*, AND A NOTE
 ON *SPHEX FLAVA* OF FABRICIUS,
 AND ALLIED SPECIES.

BY COLONEL C. T. BINGHAM, F.Z.S., FOREST DEPARTMENT, BURMA.

(*With Plates I and II.*)

(*Read before the Bombay Natural History Society, on 2nd April, 1895.*)

After most careful comparison I have been unable to identify with any known species any of the eleven hymenopterous insects below described and contained in my collection, and I believe them to be hitherto undescribed.

Family *APIDÆ*, Leach.

1.—*ANTHOPHORA VEGETA*, n. sp., Pl. I, Fig. 1, ♀.

HABITAT: Deli, Sumatra.

FEMALE: Length 12 m.m., expanse 22 m.m.

MALE: Unknown.

DESCRIPTION.—♀. Head, thorax, and abdomen black with fulvous pubescence, dark on the thorax, paler on the outside of the tibiæ and tarsi of the legs and on the abdomen. Mandibles yellow, castaneous-brown at the tips; clypeus yellow with two large square black maculæ at the base; antennæ piceous, a short yellow streak on the scape in front; the front of the face, the vertex and the cheeks behind the eyes black with fulvous pubescence, that on the cheeks inclining to hoary; ocelli black placed in a triangle on the vertex, between the eyes and the lateral ocelli on each side the top of the head is sunk and furrowed. Thorax black and finely punctured, covered with a dark fulvous pubescence, tufted and long on the metathorax; wings yellowish hyaline, the tegulæ and nervures testaceous; legs black, with pale fulvous pubescence on the outside of the tibiæ and tarsi, the tibial calcaria and claws black. Abdomen black, densely and finely punctured, the posterior margins of the segments with broad bands of golden fulvous pubescence; below the abdomen is black, the margin of the segments narrowly testaceous.

2.—ANTHOPHORA AMYMONE, n. sp., Pl. I, Fig. 2, ♀.

HABITAT : Deli, Sumatra.

FEMALE : Length 17 m. m., expanse 30 m. m.

MALE : Unknown.

DESCRIPTION.—♀. Head, thorax, and abdomen black with fuscous black pubescence, behind the eyes and on the sides of the clypeus it is hoary, on the outside of the tibiæ and tarsi of the legs, and on the two last segments of the abdomen bright ferruginous. The mandibles testaceous, darker at the tips, the clypeus is higher than broad, punctured with a pale testaceous mark down the centre ; the pubescence on it black and thinly scattered, on the sides of the face and below it is dense and hoary-gray, and on the front between the antennæ fuscous-black ; the antennæ are piceous, the scape in front black and shining ; the vertex is bare, finely punctured and marked with three short longitudinally impressed lines leading from the ocelli forward to as far as the base of the antennæ ; the ocelli are of a deep ruby-red placed in a curve on the vertex. Thorax black with fuscous-black pubescence ; the centre of the metathorax above and the scutellum bare and finely punctured ; wings brownish-hyaline, the tegulæ testaceous, the nervures dark brown ; legs testaceous-brown, the tibiæ and tarsi with bright ferruginous pubescence on the outside ; claws dark castaneous-brown. Abdomen black, finely and closely punctured ; the posterior margins of the 1st, 2nd, 3rd, and 4th segments thickly fringed with fuscous-black pubescence, that on the terminal segments bright ferruginous ; below the abdomen is piceous-black, with the margins of the segments testaceous.

The above two species were collected at Deli in Sumatra by Hofrath Dr. L. Martin, by whom they were kindly sent to me.

3.—BOMBUS RUFO-FASCIATUS, Smith, Pl. I, Fig. 3, ♀.

BOMBUS RUFO-FASCIATUS, Smith, Trans. Ent. Soc., Lond. New Ser., II, (1852-53), p. 48, ♀.

HABITAT : Sikkim Himalayas, above 12,000 ft.

FEMALE : Length 25 m. m., expanse 46 m. m.

DESCRIPTION.—♀. Black with long black and hoary-gray pubescence ; the 2nd segment of the abdomen with a bright vermilion-red band above. Head black, narrow and long ; the mandibles, clypeus, face

and cheeks behind the eyes shining jet-black, the clypeus finely pitted, the antennæ black, the front of the face and the vertex with black pubescence, the ocelli in a straight line sunk in shallow depressions; thorax black with black pubescence, a hoary-gray band on the prothorax anteriorly not reaching the pectus, which latter is finely pitted and clothed with only scattered black hairs; the dorsal surface of the mesothorax bare and finely pitted; the metathorax with a fringe of fuscous hairs turning to hoary-gray; wings hyaline with a light brown tint, the tegulæ and nervures dark brown; legs black with stiff black pubescence turning to dark reddish-brown on the tibiæ and yellowish-brown on the tarsi; claws black. Abdomen black, the base of the 1st segment and posterior margins of the 3rd, 4th, and 5th segments with hoary-gray pubescence, the 2nd segment with a band of brilliant vermilion-red pubescence above, the anal segment testaceous, below the abdomen is piceous-black, thinly pubescent and finely pitted.

This beautiful species was not uncommon in May around and above Gnatong, the military post on the Sikkim-Thibetan frontier. I found it frequenting the wild *Auriculas* which were flowering in great abundance on the bare slopes of the moraine of the ancient glacier on which the military post has been erected. When disturbed, this *Bombus*, unlike any other species known to me, has a habit of suddenly rising perpendicularly till it disappears from sight. It does not seem, at any rate in summer, to descend below 12,000 ft. I did not meet with it on the road from Sedonchen until I got to the side slopes of Lintu, the high peak behind Gnatong.

4.—*BOMBUS MÖLLERII*, n. sp., Pl. I, Fig. 4, ♀.

HABITAT : Kumaon, Sikkim, over 8,000 ft.

FEMALE : Length 28 m.m., expanse 58 m.m.

DESCRIPTION.—♀. Black with brownish-black pubescence; the mesothorax above, the scutellum and postscutellum and the penultimate segment of the abdomen clothed with dense silvery-gray pubescence. Head long and somewhat narrow, the mandibles, clypeus, sides of the face and the cheeks shining black, the antennæ piceous, the front of the face, vertex and back of the head with dense dark brown pubescence. Thorax broad, the pro- and metathorax, the sides of the body under the wings and the pectus with black pubescence; the

mesothorax scutellum and postscutellum above silvery-gray ; the wings smoky-hyaline, the tegulae and nervures testaceous-brown; the legs black, the anterior and intermediate legs and the coxae and trochanters of the posterior pair with reddish-brown pubescence getting paler on the tarsi, the outside of the femora and tibiae of the posterior legs black and shining, the inside clothed with a dense short ferruginous-brown pile. The abdomen black with long black pubescence, the penultimate segment with a silvery-gray band above, the apical segment ferruginous-brown ; below the abdomen is destitute of pubescence, piceous-black and finely pitted.

This species was first sent to me from Kumaon. Subsequently I found it sparingly distributed above 8,000 ft. in Sikkim on Senchal and Tiger Hill near Darjeeling, and at Guntok and Sedonchen in Native Sikkim. Named after my friend Mr. F. Möller, who has done so much for the entomology of Sikkim.

5.—MEGACHILE STELOIDES, n. sp., Pl. I, Fig. 5, ♀.

HABITAT : Sikkim.

FEMALE : Length 13 m.m., expanse 28 m.m.

MALE : Unknown.

DESCRIPTION : ♀. Black, the two apical segments of the abdomen and the tibiae and tarsi of the legs testaceous-yellow ; the scutellum projecting backwards and completely overhanging the metathorax as in *Stelis*. Head as broad as the thorax, shining, very finely pitted ; mandibles black quadridented, very broad at the tips ; clypeus large, oval, slightly convex, its anterior margin bisinuate ; antennae piceous ; the back of the head flat, the ocelli placed in a broad triangle on the vertex. Thorax very densely and coarsely pitted, the mesanotum bearing three short longitudinally impressed lines not reaching to its posterior margin, the scutellum in shape like that of the species of *Stelis* projecting backwards and overhanging the metathorax, its posterior margin rounded and notched in the middle ; wings hyaline, the apical margins broadly but lightly infuscated, tegulae and nervures dark brown ; legs black, the outer margins of the femora, the tibiae and tarsi rich ferruginous-brown. Abdomen black and shining, finely pitted, the two apical segments and the pollen-brush bright ferruginous.

This remarkable bee, which probably deserves generic separation, I found frequenting flowers and the wet sand along the banks of the Runjit river in Sikkim in May. In habits it is a true leaf-cutter bee.

6.—*MEGACHILE MINIATA*, n. sp., Pl. I, Fig. 6, ♀.

HABITAT : Deli, North-East Sumatra.

FEMALE : Length 23 m.m., expanse 38 m.m.

MALE : Unknown.

DESCRIPTION.—♀. Black with sordid white pubescence on the metanotum posteriorly and on the two apical segments of the abdomen above, the pollen-brush rich cinnabar-red. Mandibles broad, longitudinally striated, clypeus abruptly truncated in front, the anterior margin waved and narrowly smooth and shining, the rest of the head densely and finely pitted, the antennæ opaque. Thorax broad, densely and finely pitted, the scutellum prominent, the metanotum fringed posteriorly above and below with sordid white tufted hairs, mixed with fuscous-black ; wings clear hyaline-yellow, slightly iridescent, the apex somewhat broadly but lightly infuscated ; legs black, the posterior tarsi with cinnabar-red pubescence on the inside. Abdomen black, the margins of the segments sparsely pitted and fringed with black pubescence, the two apical segments above clothed with a dense fine sordid white pile, the pollen-brush and a spot on either side of the 2nd segment a rich cinnabar-red.

Described from eight specimens collected in the North-East of Sumatra and kindly sent to me by Hofrath Dr. L. Martin. This species is closely allied to *Megachile luctuosa*, Smith, from Singapore, but it is considerably larger, differs in the colour of the pollen-brush, and has no white pubescence on the 2nd, 3rd, and 4th segments of the abdomen. It still more closely resembles *Megachile terminalis*, Smith, from the Celebes, from which it differs in the colour of the wings and pollen-brush.

Family *POMPILIDÆ*, Leach.

Priocnemis Group.

7.—*SALIUS NICEVILLI*, n. sp., Pl. I, Fig. 7, ♀.

HABITAT : Sikkim, Tenasserim.

FEMALE : Length 24-30 m.m., expanse 46-52 m.m.

MALE : Length 23-25 m.m., expanse 40-43 m.m.

DESCRIPTION.—♀. Head, thorax and abdomen dark brownish-red, the two former clothed with a short dense pile, which in certain lights

has a golden lustre; the posterior margins of the segments of the latter broadly black. Head as broad as the thorax, eyes distinctly converging above, below reaching up to the base of the mandibles, ocelli in an equilateral triangle on the vertex; forehead slightly concave, bearing a short vertically impressed line above the base of the antennæ, these latter rather slender, convolute, destitute of pubescence and of a somewhat lighter colour than the rest of the head, with the tips from the apex of the penultimate joint darkening into dusky black; clypeus broadly oval, twice as broad as high, convex; mandibles castaneous, their tips black. Thorax, the pronotum anteriorly almost transverse, its posterior margin obtusely angled, mesonotum slightly convex, scutellum and postscutellum raised and prominent, metanotum gently rounded, posteriorly declivous, transversely striated, on either side it bears a broad shallow sulcation which, however, does not reach to its apex, the side tubercles and stigmata well marked and prominent; wings hyaline, of a light ferruginous-yellow, the lower portion of the hind- and the apical margin of the forewing infuscated, the tegulæ and nervures ferruginous-yellow; in the forewing the transverse cubital nervure rises well before the apex of the submedial cell, and the 1st recurrent nervure is received in the apical 3rd of the 2nd cubital cell, in the hindwing the cubital nervure rises immediately after (almost at) the apex of the anal cell; legs long, of a light ferruginous-red, the tibiæ of the intermediate and posterior legs grooved, serrated and spined; the claws castaneous-brown, one-toothed at their base below. Abdomen subpetiolate, ferruginous-red, the posterior margins of the first four segments broadly black, of the two apical segments only slightly blackish at the sides; on the ventral side the 1st segment is wholly black, the 2nd to the 5th red at base with broad black margins, the apical segment ferruginous, studded with a few stiff hairs of the same colour. The 2nd segment (♀) bears a well-marked furrow at its base below.

♂. Closely resembles the ♀, but is of a lighter and more testaceous-red, and the wings are darker and more dusky than yellow. It is, of course, considerably smaller in size.

The nearest ally of this insect is *Salix audax*, Smith, which however is structurally different, belonging to the *Hemipepsis* group

of the genus *Salius*. In colour *S. audax* is a much deeper richer red than *S. nicevillei*, and this difference holds good through a series of six specimens of *S. audax* and eight of *S. nicevillei*. Sikkim specimens of this latter insect vary very much, being considerably smaller with conspicuously more dusky wings.

8.—*SALIUS ZELOTYPUS*, n. sp., Pl. I, Fig. 8, ♂.

HABITAT: Tenasserim.

MALE: Length 20-24 m.m., expanse 48-51 m.m.

FEMALE: Unknown.

DESCRIPTION.—♂. Head, thorax and abdomen black with ferruginous-brown markings. Mandibles ferruginous, darkening to brownish-black at the tips, clypeus lighter brown, oval, boldly convex and covered with a fine thin ferruginous pile, the face below the antennæ on the inside of the eyes yellow, scape of antennæ ferruginous, flagellum black, forehead, vertex, and cheeks black and shining, sparsely studded with black hairs, ocelli placed in a broad triangle on the vertex. Thorax, the prothorax light ferruginous-brown darkening to fuscous-black below, anteriorly it is rounded, its posterior margin arched or widely angled; rest of the thorax, pectus and pleuræ dark fuscous-black, the scutellum and postscutellum marked with light ferruginous-red; the metanotum long, gently rounded, posteriorly declivous with transverse striations and rather long thinly scattered black pubescence, a ferruginous stain on either side on the posterior angles; wings dark fuscous-brown with a purple effulgence, the tegulæ and nervures dark brown; an irregular hyaline yellow stain occupies part of the 1st and 2nd discoidal, the 1st cubital and the 2nd submedial cells in the forewing. This hyaline patch varies in different specimens, in some extending more or less into the radial and 2nd cubital cells in the forewing and even into the radial and medial cells of the hindwing. In the forewing the transverse-medial nervure rises well before the apex of the 1st submedial cell, and the 1st recurrent nervure is received in the apical third of the 2nd cubital cell; in the hindwing the cubital nervure is interstitial, rising at the apex of the anal cell; legs ferruginous-brown, the coxæ and trochanters and the apical joints of the intermediate and posterior tarsi and the claws black, the tibiæ and tarsi of the intermediate and posterior legs thickly spined

and slightly grooved, the tibial calcaria half the length of the metatarsus. Abdomen subpetiolate, dark ferruginous-brown, thinly covered with scattered and somewhat decumbent black pubescence, the posterior margins of the 1st and 2nd segments black, of the 3rd, 4th, and 5th dusky brownish, the apical segment ferruginous-red; the abdomen below has the 1st segment black, the base of the 2nd light ferruginous-brown marked with a conspicuous transverse impressed line, beyond which the rest of the ventral segments are dusky brownish, the apical segment studded with a few still black hairs.

This species is not uncommon along the foot of the Daunat range in Tenasserim at about 500 ft. elevation. It frequents low herbage and bushes, and I have taken one occasionally sucking up the moisture from the wet sand by the side of hill streams in the Daunat. The female has not yet been procured.

9.—*SALIUS EXILIPES*, n. sp., Pl. I, Fig. 9, ♀.

HABITAT: Sikkim.

FEMALE: Length 19 m.m., expanse 36 m.m.

MALE: Unknown.

DESCRIPTION.—♀. Head, thorax, and abdomen light yellowish-brown with golden pubescence. Mandibles dark brown, almost black at the tips; clypeus convex, broader than high, covered with thick golden pile; its anterior margin bare, shining and recurved; antennæ dark brown, the scape and the base of the 1st joint of the flagellum with golden pile, the face, forehead, vertex, back of the head and cheeks covered with golden pubescence; eyes parallel reaching up to the base of the mandibles, ocelli small, placed in an equilateral triangle on the vertex. Thorax brown, covered with golden pubescence, the metathorax with a longitudinally impressed line or furrow down the centre not reaching its apex; posteriorly the metanotum is abruptly declivous, its apex funnel-shaped and truncated, with the margin recurved; wings light brown, hyaline, somewhat iridescent, tegulæ and nervures testaceous, the former covered with golden pile, a hyaline spot in the internal angle of the 1st discoidal cell of the forewing, the transverse medial nervure rises well before the apex of the 1st submedial cell, the 1st recurrent nervure is received about the middle of the 2nd cubital cell; in the hindwing the cubital nervure is interstitial, rising at the apex of the anal cell; legs very long, light

yellowish-brown, the coxæ and trochanters covered with golden pile and some long golden hairs, the intermediate and posterior tibiæ serrated, grooved and thickly spined; the claws long and slender, bearing one conspicuous tooth on their inferior edges, the tibial calcaria short, stout, reaching only to about one-third the length of the metatarsus. Abdomen subpetiolate, of a light yellow-brown, covered with golden pile, the 1st segment dusky at base, the abdomen below dark brown, the posterior margins of the segments testaceous, the 2nd ventral segment with an impressed line or furrow at its base.

The type specimen of this was procured at Darjeeling by Mr. T. A. Hauxwell, Deputy Conservator of Forests, who kindly gave it to me. The insect belongs to the *Priocnemis* section of the *Salius* group, distinguished by the remarkable length of their legs. It resembles *Salius* (*Priocnemis*) *crinitus*, *mihi*, from Ceylon.

10.—*SALIUS MOMUS*, n. sp.

HABITAT : Tenasserim.

FEMALE : Length 13 m.m., expanse 20 m.m.

MALE : Unknown.

DESCRIPTION.—♀. Black, the abdominal segments with gray pile on their posterior margins. Mandibles black, clypeus very low and broad, anteriorly emarginate, covered with a fine silvery pile which extends on to the front and face and coxæ, antennæ black convolute, head broad, posteriorly concave. Thorax short and broad, the pronotum gibbous laterally, its posterior margin widely angled, the metanotum convex above, posteriorly declivous and marked with transverse striæ; wings hyaline, the apex of the forewing and an obsolete cloud occupying the 2nd cubital and the upper portion of the 2nd discoidal cells fuscous, the tegulæ and nervures black; in the front wing the transverse-medial nervure rises before the apex of the 1st submedial cell, and in the hindwing the cubital nervure after the apex of the anal cell; legs black, the intermediate and posterior tibiæ very strongly spined, grooved and serrated, claws with one tooth on their inferior edges. Abdomen black, the bases of the segments above broadly plumbeous-gray, the apical segment with a thick tuft of reddish-brown hairs, and the 2nd segment below with an impressed line or furrow at its base.

This species closely resembles some of the black and gray species of *Pompilus* and *Pseudagenia*. It is, however, a true *Salix* in structure, having the intermediate and posterior tibiae strongly serrated and spined. It is not uncommon in bamboo jungle in August and September, and I once watched a female fighting with a large hairy spider which she finally paralyzed and carried off, but she flew so swiftly that I lost sight of her in the thick undergrowth and so failed to find the nest.

Hemipepsis Group.

11.—*SALIX MARTINII*, n. sp., Pl. I, Fig. 10, ♀; 11, ♂.

HABITAT : Deli, North-East Sumatra.

FEMALE : Length 30 m.m., expanse 58 m.m.

MALE : Length 21 m.m., expanse 44 m.m.

DESCRIPTION.—♀. Head, thorax and abdomen jet-black, smooth and shining, a fine silky silvery-white pile on the posterior portion of the thorax above ; wing fusco-hyaline, legs reddish-yellow. Head broad, eyes distinctly converging above, below reaching well up to the base of the mandibles ; mandibles narrow, shining black with a reddish testaceous tinge at the tips, clypeus broad, convex, slightly porrect, finely pitted and clothed with stiff decumbent hairs ; its anterior margin arched upwards and stained with testaceous-red ; a streak on the inside of the eyes and another short streak behind starting from near the vertex reddish-yellow, front of the face, vertex, and back of the head black with scattered black hairs ; antennæ dusky yellow-fusca at apex ; the scape and flagellum below brighter yellow, the ocelli small, in an equilateral triangle on the vertex, a shallow furrow from the anterior ocellus down the forehead to between the base of the antennæ. Thorax black, very closely and finely pitted ; the pronotum short, widely arched posteriorly, the mesonotum convex, scutellum and postscutellum prominent, the metanotum sharply declivous posteriorly, its apex funnel-shaped with recurved edges, the mesothorax, scutellum, postscutellum and metathorax above clothed with a beautiful fine silvery pile, which in the type specimen is much abraded, but from the traces left evidently covered the whole of the after part of the thorax ; the metathorax transversely striate above, the side tubercles and stigmata well marked ; wings dark fuscous with a purplish effulgence, tegulæ and nervures dark brown, a large prominent wing spot in the 1st discoidal cell, opaque anteriorly, clear hyaline

towards the inner angle, with a central small round opaque spot; in the forewing the transverse medial nervure rises well before the apex of the 1st submedial cell, and the 1st recurrent nervure is interstitial with the 2nd transverse cubital nervure, which latter is curved outwards; in the hindwing the cubital nervure rises with an abrupt curve inwards well before the apex of the anal cell; legs reddish-yellow, the coxæ, trochanters, and basal half of the femora black and shining, the intermediate and posterior tibiæ thickly spined, serrated and grooved, the tibial calcaria short and stout, the claws dusky black with two teeth on their inferior edges. Abdomen black and shining, subpetiolate, the apical segment thickly pubescent above, and studded with stiff black hairs, the 2nd segment with a well marked transverse furrow at its base below.

♂. Differs from the ♀ in the clypeus and the face in front, a band on the posterior margin of the prothorax and the top of the mesothorax and scutellum, with the coxæ, trochanters, and femora of the legs being yellow instead of black, and in the specimen under observation, the complete absence of any silvery pile on the thorax above.

Two specimens of this well marked and distinct species I owe to the kindness of Hofrath Dr. L. Martin, who procured them in the North-East of Sumatra. I may note that I had some hesitation in assigning the ♂ specimen figured and described to this species; but after a very careful comparison with the known males of other allied species, I have come to the conclusion, with some doubt still, that the two specimens described above are the ♂ and ♀ of one species.

12.—*PSEUDAGENIA DANAE*, n. sp., Pl. I, Fig. 12, ♀.

HABITAT: Sikkim, Assam, Tenasserim.

FEMALE: Length 21—25 m.m., expanse 36—40 m.m.

MALE: Length 13 m.m., expanse 32 m.m.

DESCRIPTION.—♀. Head, thorax and abdomen black, with golden pubescence on the head and thorax, antennæ and legs pale reddish; the entire head, the front and sides of the pro- and mesothorax, the sides and dorsal surface of the metathorax, and the outside of the coxæ and trochanters of the legs clothed with fine short glistening golden pile. The mandibles pale reddish, their tips black, the clypeus convex,

transverse, twice as broad as high, the antennæ inserted low down just above the clypeus, the scape and the first three joints of the flagellum pale reddish, the apical joints dusky black; the eyes distinctly converging above, the ocelli placed in an equilateral triangle on the vertex, a shallow short impressed line runs vertically down from the anterior ocellus to between the antennæ. Thorax, the prothorax very short, its anterior margin convex, the mesothorax broad, slightly convex and rounded above, indications of golden pile on the sides of the scutellum and postscutellum, the metathorax long, gibbous, posteriorly rounded, with a broad shallow central longitudinal sulcation and well marked transverse striæ; wings hyaline yellow, the front wing from beyond the middle of the 1st discoidal cell, and the hindwing at the apex dusky purplish, slightly iridescent; the transverse medial nervure of the forewing rises before the apex of the 1st submedial cell and the cubital nervure of the hindwing after the apex of the anal cell, the tegulæ and nervures dusky red; legs with the base of the coxæ black, the apex and outer side, and the trochanter with golden pile, the femora, tibiæ and tarsi pale dusky red, the last joint of the tarsi and the claws black, the latter with one tooth on their inferior edges, the tibiæ and tarsi of the intermediate and posterior legs studded with minute spines, the inner tibial spur of the posterior legs not more than half the length of the metatarsus. Abdomen black-pruinose distinctly petiolated, the apex studded with ferruginous hairs.

♂. Differs from the ♀ in the pubescence, being silvery instead of golden, the antennæ fuscous, the forewings darker throughout, and the first three segments of the abdomen reddish.

This very handsome pompilid I procured first on some sandy banks on the Ataran in Tenasserim. Subsequently I met with it in the Runjit valley near Darjeeling, and there is a specimen in the Indian Museum, Calcutta, collected by Mr. Doherty at Margherita in Assam.

It is with much diffidence I submit the following tentative key to the genera of Indian *Pompilidæ*; for though I have spent much time and thought over its construction, and have carefully examined

hundreds of specimens, and in most cases series of many species of each genus, still I have had only the materials afforded by my own collection to judge from. My collection is fairly extensive, but the data drawn from it alone may hereafter, with more material at command, prove to be faulty. This, however, is certain that, though I have been collecting steadily for ten years in Burma and Tenasserim, and have had, moreover, large collections sent to me from various parts of India, Ceylon, the Straits Settlements and Sumatra, following the keys given below, I have had no difficulty in assigning every pompilid insect I have so far come across to what I consider its proper genus.

The classification followed is that of Kohl, in "Die Gattungen der Pompiliden," Verh. der K. K. Zool. Bot. Ges. Wien, 1884.

Key to the Indian Genera of Pompilidæ.

- A. Forewing with three complete cubital cells.
 - a. Femora not serrated below. Intermediate and posterior tibiæ furnished with spines.
 - a¹. Posterior tibiæ cylindrical ; spines minute.
 - a². In the forewing the cubital nervure stopping short of, and the discoidal nervure reaching up to, the margin of the wing.

I. Pseudagenia, Kohl.

- b². In the forewing both cubital and discoidal nervures reaching up to the margin of the wing.

II. Ceropales, Latreille.

- c². In the forewing both cubital and discoidal nervures stopping short of the margin of the wing.

III. Pompilus, Fabricius.

(Group *Ferreola*, Latreille.)

- b¹. Posterior tibiæ cylindrical ; spines long, scattered, and irregular.

III. Pompilus, Fabricius.

(Excluding *Ferreola* and *Aporus*.)

- c¹. Posterior tibiæ angular, grooved above and serrated with spines, short, stout, in double row.

- d². The 1st recurrent nervure received at the extreme apex of the second cubital cell, the 2nd transverse-cubital nervure bent outwards.

IV. *Salius*, Fabrici^{us}.

(Group *Hemipepsis*, Dahlbom.)

- es. The 1st recurrent nervure received before the apex of the second cubital cell, the 2nd transverse-cubital nervure oblique, not bent.

IV. *Salius*, Fabricius.

(Group *Priocnemis*, Schioedte.)

- b. Femora serrated below. Intermediate and posterior tibiae entirely destitute of spines or hairs.

(V. *Macromeris*,* Lepelletier.)

- B. Forewing with only two complete cubital cells.

- a. Head flattened above.

VI. *Planiceps*, Latreille.

- b. Head rounded above.

VII. *Pompilus*, Fabricius.

(Group *Aporus*, Spinola.)

NOTE ON *Sphex flava*, FABRICIUS, AND ITS ALLIES.

Working out the fossorial wasps belonging to the family *Pompilidæ* in my collection, I have been greatly puzzled to make out what the *Sphex flava* of Fabricius is. The insect I identify as such is figured on pl. II, fig. 1: It has the head, the thorax above as far as the postscutellum, the wings except at the apex, the legs in part, and the three apical segments of the abdomen ferruginous, the pectus, sides, metathorax, the coxæ trochanters and base of the femora, and the basal segments of the abdomen jet-black; the apex of the forewing beyond the radical cell is fuscous-brown with a purple effulgence.

Fabricius in the "Entomologia Systematica," vol. ii, p. 217, thus describes *Sphex flava* :—

"80. S. Atræ, dorso anoque ferrugineo, alis apice fuscis.

* Smith (Jour. Linn. Soc., vol. ii, p. 97) has described a species, *Macromeris argentifrons*, from Borneo, Malacca, Singapore and Java as having "the tibiae slightly spinose," a character not in accordance with Lepelletier St. Fargeau's original diagnosis of the genus. I think it probable Smith's species, when the types are carefully examined, will prove to be not a *Macromeris* at all.

"Habitat in India Orientali.

"Statura *S. cyanæ*. Antennæ convolutæ ferruginæ. Caput et thorax obscure ferrugineo, pectore atro. Abdomen atrum ano sive ultimo segmento ferrugineo. Alæ flavæ apice fuscæ.

"Variat segmentis abdominis aliquot basi flavis."

In the "Systema Piezatorum," p. 197, Fabricius quotes the short diagnosis given in the "Entomologia Systematica" and places the insect under his genus *Pompilus*.

At page xviii of the introduction to his "Hymenoptera Europea," vol. i, Dahlbom gives a catalogue by Professor Behn of the Fabrician collection of *Hymenoptera* in the Museum at Kiel, and at page xx notes that *Pompilus flavus*, Fabricius = *Priocnemis flavus* in his work. At page 457 in the "Tabula Examinationis Synoptica Specierum Pompilidarum," *Priocnemis flavus* is described briefly as follows :—

"*Divis. 1.* Abdomen nigrum (ano rarissime fulvo)."

* * * * *

* * * * *

"*Subdivis. 3.* Alæ lutæ aut fulvæ, apice fumatæ. Vena cubitalis a marginæ alæ anticæ apicali sat remota.

"A. Alæ luteo-hyalinæ. Alæ posticæ cellula analis ante originem venæ cubitalis terminata. Caput, thorax antice, anus, pedes antennæque fulvæ. Clypeus margine apicali subtruncatus. Corpus mediocrem...6. *Priocn. flavus*, Fabr. ♂, ♀.

India Oriental. Fabr. Egyptia, *Hedenborg*."

Lepelletier St. Fargeau in his great work on the *Hymenoptera*, vol. iii, p. 430, describes *Pompilus flavus*, thus :—

"Antennæ caputque luteo-testacea ; thorace concolori, inferius tamen fusciori. Abdomen fuscum, segmentorum primi secundique basi plus minusve testaceo-ferruginæ. Anus luteo-testaceus. Pedes ferrugineo-testacei: coxis, trochanteribus et femorum quatuor posticorum basi interna cum tarsorum apice fuscis. Alæ ferrugineo-testaceæ, apice nigro-violacio marginato: hæc ala um fascia à radealis apice ad alæ apicem extenditur, et eundo fit latior. Prothorax angustus, postice subacutè emarginatus. Metathorax mediocris, convexus, postice

declivis. Cubitalis tertia ad radialem parum angustata, secundæ ferè æqualis. *Femina.*”

Note that Dahlbom says distinctly “thorax antice” and not the whole of the thorax “fulva.” The species I take to be *flava* agrees with the description in this and also with Fabricius’ and Lepelletier’s descriptions, even to there being varieties which have the base of the 1st and 2nd segments of the abdomen stained with testaceous-yellow ; but then the whole of the series of over twenty specimens I have have the *three* apical segments and not the anus alone ferruginous.

Dahlbom again—and here comes the confusion at page 123 of the work quoted above—describes an insect under the name *Hemipepsis flava* thus :—“26. Genus HEMIPEPSIS, Dlbm. “(1) *flava*, ♂, ♀ ; media (subsemi-pollicaris et ultra) atra, oculis brunneis ; capite cum antennis-pro- et mesonotis, genubus, tibiis, tarsis alesque subaureo-fulvis, his apice nigro-violascenti-fumatis, ano nonnunquam brunescente ;” and he gives as synonyms “*Sphex flava*, Fabr. E. S. 2, 217, 80 ; *Pompilus flavus*, Fabr. Piez. 197, 52 ; anne *Pompilus luteipennis*, Fabr. Piez. 198, 54 ; and *Pompilus fulvipennis*, Fabr. Piez. 198, 57, huic referendi.”

Now as Dahlbom instituted the genus *Hemipepsis* and considered it differed from *Priocnemis*, and as he specially notes (introduction to “Hymenoptera Europea,” vol. i, p. xx referred to above) that his *Priocnemis flavus* = *Pompilus flavus*, Fabr., it seems to me clear that there is some mistake in his putting the synonyme above-quoted under *Hemipepsis flava*, which insect, in my opinion, is quite distinct from *Pompilus flavus* of Fabricius. I am the more inclined to think so, because further on at p. 462 in the “Tabula Examinationis Synoptica Specierum Pompilidarum,” Dahlbom allows *luteipennis* and *fulvipennis* of Fabricius to stand as distinct, and gives *Hemipepsis flava* apparently as his own species. I note later on what I take this insect, *Hemipepsis flava*, Dahlbom, to be.

In the Catalogue of Hymenopterous insects in the British Museum, Pt. iii, by Mr. F. Smith, at page 182, the following are enumerated :—

“1. MYGNIMIA SEVERA.

“*Sphex severus*, *Drury*, Ill. Exot. Ins. iii., t. 42, p. 4.

“*Hab* : India. (Coll. W. W. Saunders, Esq.)

“2. MYGNIMIA FLAVA. B. M.

"*Sphex flava*, *Fabr. Ent. Syst.* ii, 217, 80; *Pompilus flavus*, *Fabr. Syst. Piez.*, p. 197, 52; *St. Farg. Hym.* iii, 430, 21; *Hemipepsis flava*, *Dahlb. Hym. Europ.* i, 123, 1."

Here Smith identifies the *Sphex flava* of Fabricius with the *Hemipepsis flava* of Dahlbom, but keeps the *Sphex severa* of Drury distinct. Later on in his Catalogue of the Aculate Hymenoptera and Ichneumonidae of India and the Eastern Archipelago, published in 1867 in the Journal of the Linnean Society, vol. xi, at page 357, he has

"Gen. MYGNIMIA, Schuck.

"1. MYGNIMIA (SPHEX) FLAVA, *Drury, Ill. Exot. Ins.* iii, tab. 42, fig. 4, ♀; *Smith, Cat. Hym. Ins.* iii, 182, 2; *Proc. Linn. Soc.* 11, 1.

Pompilus flavus, *Fabr. Syst. Piez.*, p. 197, 52; *St. Farg. Hym.*, iii, 430, 21.

"*Hemipepsis flavus*, *Dahlb.*

Hym. Eur. i, 123.

"*Hab*: India, Borneo, Singapore, Gilolo, Sumatra."

Here evidently two species, *Sphex severa*, Drury, and *Sphex flava*, Fabricius, are confused together. The reference, fig. 4, pl. 42 of Drury's work, represents *severa*, a fairly common species in Burma, of which I give a figure, Pl. II, fig. 1. This species is also very constant in form and colour. I have only one specimen, and that is from Sumatra, which varies in being a dusky black all over and having the basal half of both wings fuscous shot with purple.

Cameron (*Mem. and Proc. Manch. Lit. and Phil. Soc.*, 4th series, vol. iv, Pt. iii, pp. 443-445) and I (*Journ. Bom. Nat. Hist. Soc.*, vol. v, p. 371), following Smith, have fallen into the same error in giving the synonyme of the two species.

In the *Ann. and Mag. Nat. Hist.*, Series iv, vol. xii (1873), p. 257, Smith describes a large *Salix* under the name *Mygnimia intermedia* as follows:—

"*Female*. Length 16 lines. Black, the head, pro- and mesothorax, and the legs, except the coxæ, trochanters, and base of the femora reddish-yellow. The antennæ yellow; tips of the mandibles black. The anterior margin of the pro- and mesothorax blackish; the meta-thorax black, truncate posteriorly and transversely striated; the wings flavo-hyaline. Abdomen smooth and shining.

"*Hab.*: N. India, Ceylon."

A species answering exactly to this description is not uncommon in Tenasserim, and comparing it with Dahlbom's brief description of his *Hemipepsis flava* (Hym. Eur., i, pp. 123 and 462), it seems to me very close to, if not identical with, that insect, which, I may again note, is in my opinion not the *Pompilus* (*Sphex*) *flavus* of Fabricius. If my conjecture is right, and *Hemipepsis flava*, Dahlbom=*Mygnumia intermedia*, Smith, then Smith's name must stand for the insect, as under the classification of the *Pompilidæ* proposed by Kohl (Gattungen der Pompiliden in Verh. der K. K. Zool. Bot. Ges. Wien, 1884), and accepted by our greatest living English Hymenopterist, Cameron, the genera *Hemipepsis*, Dahlbom, and *Priocnemis*, Schioedte, are both placed as groups only of the genus *Salix*, Fabricius.

In the Annali del Mus. Civ. di Storia Naturale di Genoa, 2nd series, vol. i (1884), at page 349, Gribodo mentions having received from Burma three specimens of a pompilid which he identifies as *Priocnemis flava*, Fabr. (*apud* Dahlbom), and describes another species which he names *Hemipepsis sycophanta* as new.

With reference to the former, I give a translation of his remarks as they bear on the difficulty of identifying the *Sphex flava* of Fabricius :—

“20. PRIOCNEMIS FLAVUS, Fabr.

“*Sphex flava*, Fabr. Ent. Syst. ii, p. 217, n. 80.

“*Pompilus flava*, Fabr. Syst. Piez., p. 197, n. 52.

“*Priocnemis flava*, Dhlb. Hym. Eur. i, p. 457, n. 6.

“Three females sent by Signor Comotto correspond well with the description (of *Priocnemis flava*) given by Dahlbom in his Hymenoptera Europea.

“It is necessary to note, however, that in the same work he mentions a *Hemipepsis flava* which would appear to be referable to *Pompilus flava* of Fabricius. These two species (*i. e.*, *Hemipepsis flava* and *Priocnemis* [*Pompilus*] *flava*) would appear to differ not only in generic characters, such as the number of teeth on the tarsal claws and the neuration of the wing, but also in the colour of the extremity of the abdomen. I know not how to explain this confusion by the learned and accurate author. It may be that it arose from his having found among Fabricius' types allied but distinct species labelled under the same name, a mistake often made by the earlier Entomologists whose

superficial observation and want of minute accuracy often led to the confusion of species which were not unfrequently generically distinct. I can, however, affirm that the specimens sent from Burma belong without doubt to the genus *Priocnemis*."

Of *Hemipepsis* (?) *sycophanta*, he says:—

"This species was collected by Captain Comotto at Minhla. The type is in my collection, and was sent to me from the English possessions in India, having been probably collected in the neighbourhood of Colombo in Ceylon. It is difficult to classify this insect. First, it is as well to note that it cannot be considered a true *Hemipepsis*, because the posterior tibiae are not serrated nor even strongly spinose, the elevated longitudinal folding or grooving (repiegatura) of the tibiae which in true *Hemipepsis* has the edges deeply indented in the manner of a saw is in this species, on the contrary, hardly even lightly wavy, and almost continued in a perfectly straight line. It cannot, however, be placed in the genus *Pompilus* (vera), because it has not only the claws strongly bidentate, but bears a transverse impressed line or furrow on the 2nd ventral segment."

Three other allied species may be noted here. *Priocnemis gigas*, Taschenberg, described in the Zeitschrift für die Gesamten Naturwissenschaften, xxxiv, (1869), p. 40, 16, as follows:—

"16. *Pr. gigas*: *Niger, alis, capite cum antennis, thorace pro partibus; pubescentia, pedibus anoque fulvis. Long. 42 Mill, ♀ ...* Java.

"It is unfortunate that the only specimen has the apex of the wing much torn, and the pubescence on the body considerably abraded, for which reason its real appearance cannot be ascertained. The head and antennae are light reddish-yellow, the front of the face and the forehead with thick decumbent orange-yellow pubescence. The olypeus has its outer margin short, smoothly arched, inwardly transverse, its anterior angle obtuse and well rounded, wide at its arched base, which is at the same height as the base of the antennae, which latter are placed in somewhat small depressions. The posterior margin of the prothorax is very obtusely angled, emarginate, also rather flatter than the rest, and where the pubescence has been rubbed, red in colour. The meso- and metathorax are black covered

with a very fine light yellow pubescence; the metathorax posteriorly gently arched and declivous, transversely striate, with conspicuous obliquely placed stigmata. The pubescence on the abdomen has a greyish appearance, the apical segment on its dorsal and partly on its ventral side also clothed with decumbent bristly yellow hairs. The legs by reason of the pubescence are of a reddish-yellow, the coxæ chiefly on account of the same appear of a like tint. The posterior tibiæ are strongly spinous, and, having regard to their size, but feebly serrated, while the pubescence is prolonged into a like-coloured silky stripe. The claws have in their middle a short rather strong tooth. The wings at the base through their pubescence are likewise of a dusky yellow without a trace of a blackish tint, but towards the posterior margin they become lighter, at least in the only example obtained, the apex of the hindwing is whitish. The submedial cell of the forewing has its outer margin oblique, and the 1st recurrent nervure is received close to the outer angle of the 2nd cubital cell, which, bounded outwardly by the 2nd transverse cubital nervure, has this latter angled and imperfect. The anal cell of the hindwing extends beyond the origin of the cubital nervure."

In the Journal of the Bombay Natural History Society, vol. viii, p. 372, I described a large *Salix* under the name *elizabethæ*. At that time I was certain it was previously undescribed, as I had compared it with the descriptions of all nearly allied species, including *Priocnemis gigas* of Taschenberg. However, after further careful comparison, I am not happy about *Salix elizabethæ*, and I think it is very probably identical with *Salix (Priocnemis) gigas*, Taschenberg.

Finally, there is my *Salix (Hemipepsis) convexus*, described in Journal Bombay Natural History Society, vol. v, p. 237, which in a way resembles *Salix (Hemipepsis) intermedius*, but is very considerably smaller, and differs in the colouring of the wings and abdomen.

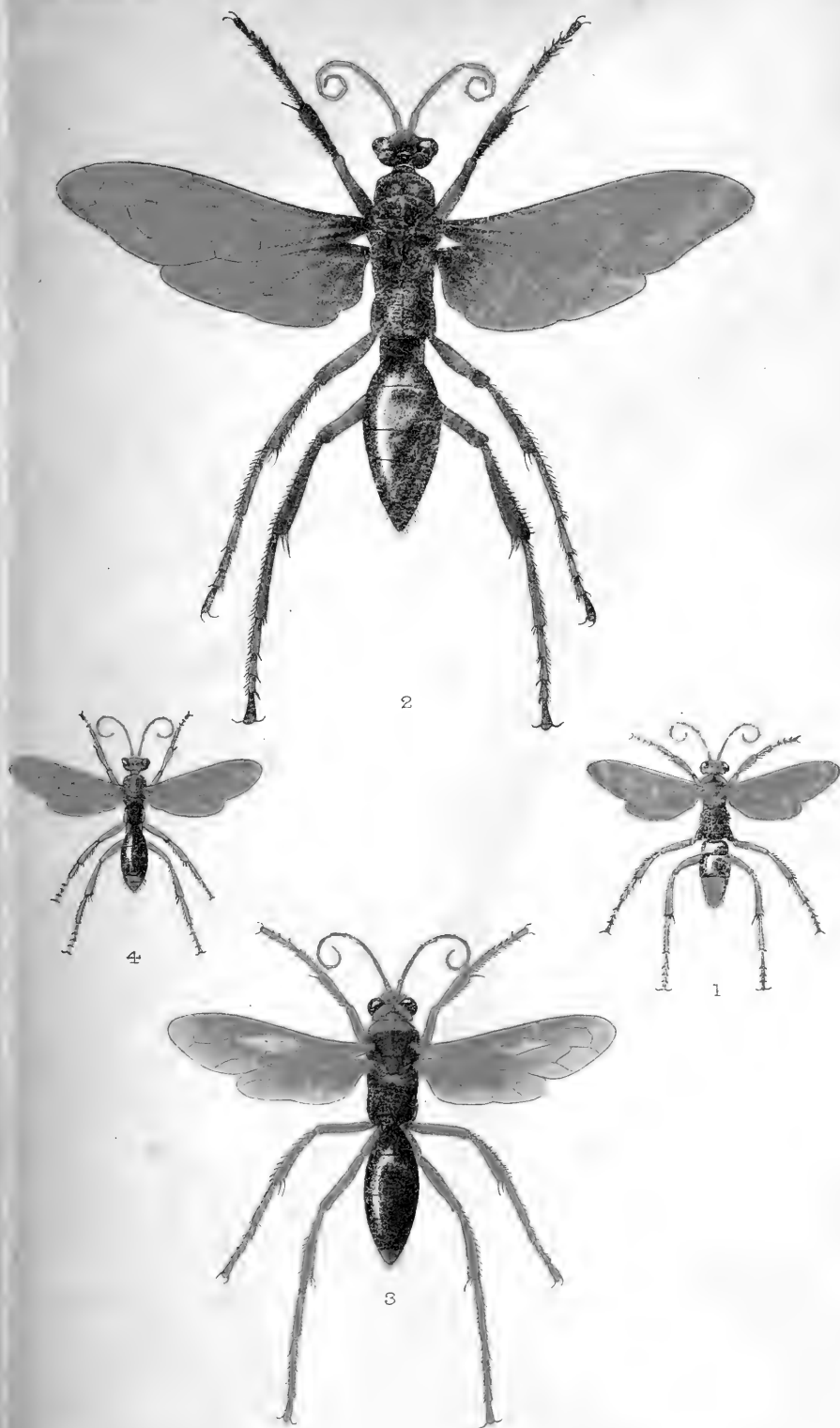
To sum up. I believe the following closely allied species of the genus *Salix* exist, all having the yellow and black type of colouring.

Priocnemis Group.

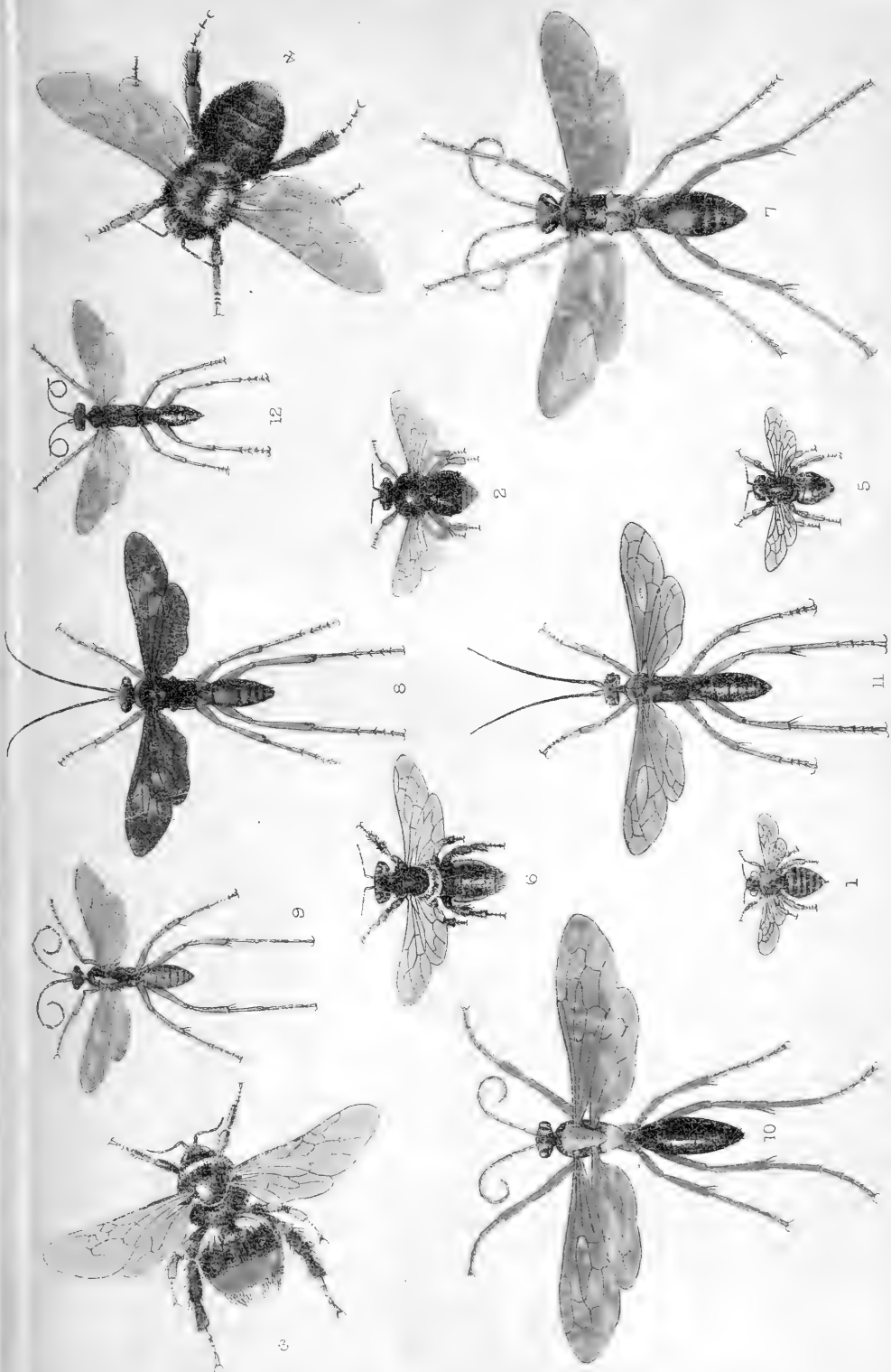
1.—*SALIUS FLAVUS*, Fabricius, Pl. II, Fig. 1, ♀.

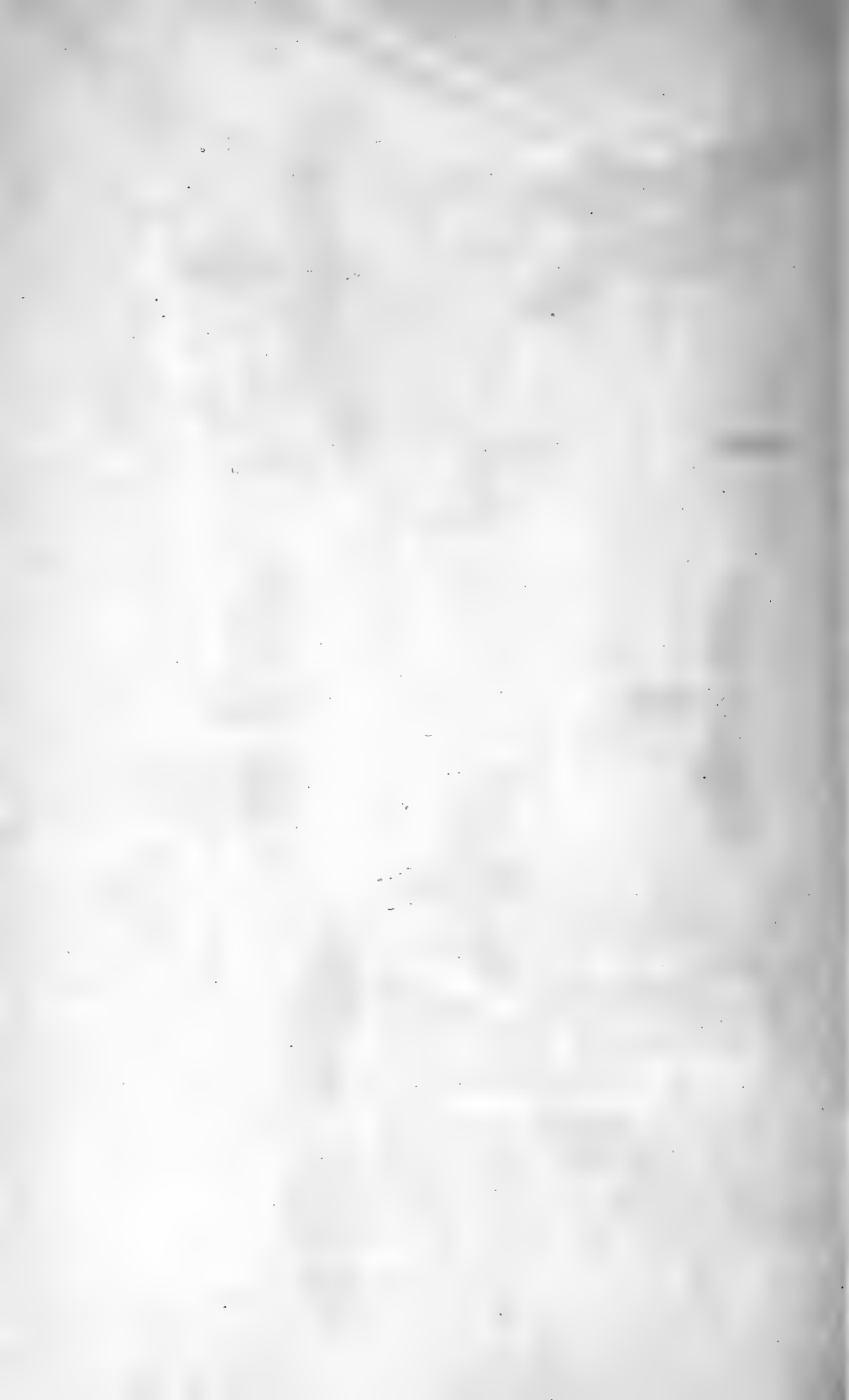
Sphex flava, Fabr. Ent. Syst. ii, p. 217, 80.

Pompilus flavus, Fabr. Syst. Piez, p. 197, 52; *Lepel. Hym.* iii, p. 430, 21.









Priocnemis flavus, *Dahlb. Hym. Eur.* i, p. 457, 6; *Gribado, Ann. d. Mus. Civ. di Genova*, 2nd series, vol i (xxi), p. 349, 20.

Mygnimia flava, *Smith, Cat. Hym. Ins. Brit. Mus.* Pt. iii, p. 182, 2; *Jour. Linn. Soc.* xi, p. 357, 1.

Salus flavus, *Cam. Hym. Orient. Mem. & Proc. Manchester Lit. and Phil. Soc.*, 4th series, vol. iv, Pt. iii, p. 443, 11; *Bingh. Jour. Bomb. Nat. Hist. Soc.*, vol. vii, p. 371, 9.

Habitat. India. Burma.

Hemipepsis Group.

2.—*SALIUS SEVERUS*, *Drury, Pl. II, Fig. 2, ♀.*

Sphex severa, *Drury, Ill. Exot. Ins.* iii, t. 42, fig. 4.

Mygnimia severa, *Smith, Cat. Hym. Ins. Brit. Mus.* iii, p. 182, 1.

Salus severus, *Cameron, Hym. Orient. Mem. and Proc. Manchester Lit. and Phil. Soc.*, 4th series, vol. iv, Pt. iii, p. 445, 29; *Bingh., Jour. Bomb. Nat. Hist. Soc.*, vol. viii, p. 371, 10.

Habitat : India, Burma, Sumatra.

3.—*SALIUS INTERMEDIUS*, *Smith, Pl. II, Fig. 3, ♀.*

Hemipepsis flava, *Dhlbm. (non Fabr.) Hym. Eur.* i, p. 123, 1, and p. 462, 3.

Mygnimia intermedia, *Smith, Ann. and Mag. Nat. Hist.*, 4th series, vol. xii, p. 257.

Salus intermedius, *Cam., Hym. Orient. Mem. and Proc. Manchester Lit. and Phil. Soc.*, 4th series, vol. iv, Pt. iii, p. 444, 18; *Bingh., Jour. Bomb. Nat. Hist. Soc.*, vol. viii, p. 372, 11.

Habitat : N. India, Ceylon, Burma.

4.—*SALIUS CONVEXUS*, *Bingh., Pl. II, Fig. 4, ♀.*

Priocnemis convexus, *Bingh., Jour. Bomb. Nat. Hist. Soc.*, vol. v, p. 237, 6.

Salus convexus, *Cam., Hym. Orient. Mem. and Proc. Manchester Lit. and Phil. Soc.*, 4th series, vol. iv, Pt. iii, p. 451, 33; *Bingh., Jour. Bomb. Nat. Hist. Soc.*, vol. viii, p. 375, 18.

Habitat : Ceylon, Tenasserim.

5.—*SALIUS GIGAS*, *Taschenberg.*

Priocnemis gigas, *Tasch., Zeits. f. d. Ges. Naturwiss. Bd. xxxiv.* (1869), p. 40, 16.

Salius gigas, Cam., *Hym. Orient. Mem. and Proc. Manchester Lit. and Phil Soc.*, 4th series, vol. iv, Pt. iii, p. 451, 37.

? *Salius elizabethæ*, *Bingh. Jour. Bomb. Nat. Hist. Soc.*, vol. viii, p. 372, 14.

Habitat : Java, Tenasserim.

I have doubtfully joined *S. elizabethæ* with this species, but the former differs from Taschenberg's description of *gigas* in several points, notably in the colour of the apical segment of the abdomen, which in a long series of *S. elizabethæ* is always black, never yellow.

From Taschenberg's description it is evident that *S. gigas* has the typical *Hemipepsis* wing. I have therefore placed it under the *Hemipepsis* section of the genus *Saluis*.

DESCRIPTION OF PLATES.

PLATE I.

Fig. 1.	<i>Anthophora vegeta</i> , n. sp.	...	...	...	♀, p. 195
" 2.	<i>Anthophora anymone</i> , n. sp.	...	...	...	♀, p. 196
" 3.	<i>Bombus rufo-fasciatus</i> , Smith	...	...	...	♀, p. 196
" 4.	<i>Bombus möllerii</i> , n. sp.	...	...	...	♀, p. 197
" 5.	<i>Megachile steloides</i> , n. sp.	...	...	...	♀, p. 198
" 6.	<i>Megachile miniata</i> , n. sp.	...	...	...	♀, p. 199
" 7.	<i>Salius nicevillei</i> , n. sp.	...	...	...	♀, p. 199
" 8.	<i>Salius zelotypus</i> , n. sp.	...	...	...	♂, p. 201
" 9.	<i>Salius exilipes</i> , n. sp.	...	...	...	♀, p. 202
" 10.	<i>Salius martinii</i> , n. sp.	...	...	...	♀, p. 204
" 11.	" " n. sp.	...	...	...	♂, p. 204
" 12.	<i>Pseudagenia danae</i> , n. sp.	...	...	...	♀, p. 205

PLATE II.

Fig. 1.	<i>Salius flavus</i> , Fabr.	...	...	...	♀, p. 214
" 2.	<i>Salius severus</i> , Drury	...	...	...	♀, p. 215
" 3.	<i>Salius intermedius</i> , Smith	...	...	...	♀, p. 215
" 4.	<i>Salius convexus</i> , Bingh.	...	...	...	♀, p. 215

LIST OF SHELLS COLLECTED AT ADEN IN 1892—95,
CLASSIFIED IN ACCORDANCE WITH THE
PAETEL CATALOGUE.

By COMMANDER E. R. SHOPLAND, R.I.M.

(Read before the Bombay Natural History Society, 14th January, 1896.)

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Argonauta tuberculosa</i> .	Lk.	Aden.	Drifted on shore off Sk. Othman. Rare
<i>Ianthina fragilis</i> ...	"	"	Do. do. Plentiful
<i>Murex anguliferus</i> ...	"	"	Plentiful at low water on mud flats.
" <i>carboneri</i> ...	Jouss.	"	Dredged in 5 fathoms in harbour. Adult large specimens rare.
" <i>clavus</i>	Kein.	"	Wn. Shore, Sk. Othman, among coral brought for lime. Very rare
" <i>cyclostomia</i> ...	Sowb.	"	
" <i>fenestrata</i> ...	Chem.	"	Only 2 small specimens, Isthmus mud flats.
" <i>haustellum</i> ...	L.	"	Dredged in 5 fathoms and on mud flats.
" <i>ramosus</i> ...	"	"	On mud flats of Maala. Plentiful
" <i>rota</i> ...	Sowb.	"	Among coral, Sk. Othman. Very rare
" <i>secundum</i> ...	Lk.	"	Only one dead specimen, south coast.
" <i>ternispina</i> ...	"	"	Common in all sandy bays.
" <i>varicosus</i> ...	Sowb.	"	Mud flats, Isthmus. Rare
<i>Pyrua ficus</i> ...	L.	"	L.W.S.T. Plentiful in sandy bays.
" <i>ficoides</i> ...	Lk.	"	Cast up dead on S. E. sands.
" <i>melongina-pa-radiasiaca</i> .	"	"	Plentiful everywhere at low water.
<i>Pisania crosseanus</i> ...	Sowb.	"	Sk. Othman, coral blocks. R
" <i>ignea</i> ...	Gmel.	"	Do. do. P
<i>Polia contracta</i> ...	Rve.	"	Dredged in harbour and on rocks, south coast. P

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Polia tritonidea-mar-</i> <i>morata.</i>	Rve.	Aden.	Dredged in harbour and among coral, Sk. Othman. M
" " <i>rubiginea.</i>	"	"	Do. do. do. M
" <i>undosa</i> ...	L.	"	Plentiful everywhere at $\frac{1}{2}$ tide
<i>Eusus forceps</i> ...	Berry.	"	Dredged off Tarshyne. Very rare
<i>Pleurotoma albifuni-</i> <i>culata.</i>	Reese.	"	Sifted from Sappers Bay sand
" <i>Baynhami.</i>	Smith.	"	Dredged off Tarshyne MP
" <i>catena</i> ...	Rve.	"	Dredged off Tarshyne. Large specimens very rare
" <i>Cecchi</i> ...	Jouss.	"	Dredged off Tarshyne MP
" <i>cingulifera.</i>	Lk.	"	Dredged in harbour. Rare
" <i>jousse a u-</i> <i>nui.</i>	Melvill.	"	Do. do. Do.
" <i>latissimata.</i>	Smith.	"	Only 1 dead specimen coral, Sk. Othman.
" <i>makemonas</i>	Jouss.	"	Do. do. specimen.
" <i>pouloensis.</i>	"	"	Dredged in harbour 5 to 7 fathoms. P
" <i>tuberculata</i>	Gray.	"	Dredged 5 to 7 fathoms, Bunder Fookum Bay. P
" <i>tigrina</i> ...	Lk.	"	Bunder Fookum Bay, L.S.T. Rare
" <i>unifasciata.</i>	Desh.	"	Do. do. Do.
" <i>vidua</i> ...	Roe.	"	Do. do. good specimens rare.
" <i>violacea</i> ...	Hinds.	"	Dredged in harbour 5 to 7 fathoms. P
<i>Daphnella citharella</i> ...	Lk.	"	Telegraph Bay, sifted from sand. Scarce
" <i>crebriplicata</i>	Rve.	"	Dredged 5 fathoms, one speci- men.
" <i>Cummingii.</i>	Powis.	"	Telegraph Bay, sifted from sand. Scarce
" <i>cylindrica</i> ...	Rve.	"	Do. do. Do.
<i>Triton cancellinus</i> ...	"	"	Rocks east shore of Isthmus position. R
" <i>clandestinus</i> ...	Lk.	"	Rocks east shore of Isthmus One dead specimen
" <i>cancellinus, var.</i> <i>decipiens.</i>	Rve.	"	Rocks east shore of Isthmus. R

G. and S. Names.	Author.	Habitat.	Remarks.
Triton epidronus anti- quatus.	Hinds.	Aden.	Dredged 5 fathoms in harbour Very rare
" epidronus-brace- teatus ...	"	"	L.W.S.T. Bunder Fookum Bay. P
" epidronus-macul- osus.	Chem.	"	Coral. Sk. Othman. Scarce
" equatilis ...	Rve.	"	Rocks between Steamer Point and Maala. Scarce
" labiosus ..	Wood.	"	Maala mud flats. P
" pilearis ...	L.	"	Do. do. and rocks. P
" Rauzani ...	Bianc.	"	Socotra.
" retusus ...	Lk.	"	Coral for lime-burning, Sk. Othman. R
" rubecula ...	L.	"	Rocky places all round coast. MP
" trilineatus ...	Rve.	"	Dredged 5 to 7 fathoms and sea face, A.L.S.R.
" vespacens ...	Lk.	"	Maala mud flats. P
Persona adicus ...	Jouss.	"	Rocks by Isthmus position, L. W.S.T.
" Shoplandi ...	Do.	"	Do. do. do.
Ranella anceps ...	Lk.	"	In coral at Sk. Othman and Telegraph Bay. P
" concinna ...	Dunker.	"	Rocks, Telegraph Bay, low water.
" granifera ..	Lk.	"	Plentiful everywhere.
" livida ...	Rve.	"	Do. do.
" spinosa ...	Lk.	"	Sandy beach, sea face, Sk. Othman. MP
Bullia lineolatum ...	Wood.	"	Telegraph Bay. Large speci- mens rare
" mauritiana ...	Gray.	"	Telegraph and all bays. P
" Tahitiensis ...	Lk.	"	Dredged near Anadyr wreck. R
Phos roseatus... ..	Hinds.	"	Sk. Othman, coral. Scarce
Cyllene Grayii ...	Rve.	"	Dredged in 5 to 7 fathoms off Tarshyne. MR
Nassa Adamsoni ...	Desh.	"	All sandy bays near rocks. R
" albescens, var. fenestrata.	Dkr.	"	Do. do. P
" arcularia ...	Lk.	"	Do. do. R
" coronata ...	L.	"	All sandy bays near rocks and mud flats. P

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Nassa dermestina</i> ...	Gould.	Aden.	Telegraph Bay, sifted from sand. P
„ <i>erythrea</i> ...	Issce.	„	All sandy bays. MP
„ <i>festiva</i> (?) ...	Rve.	„	The rocks beyond Gold Mohur Bay. Scarce
„ <i>fiscelabris</i> ...	Ad.	„	All sandy bays. Do.
„ <i>gemmulata</i> ...	Lk.	„	Do. Do.
„ <i>lentiginosa</i> ...	A. Ad.	„	Mud flats at Maala. P
„ <i>marrati</i>	E. Smith.	„	Do. do. P
„ <i>nodifera</i> ...	Powis.	„	Do. do. P
„ <i>papilosa</i> ...	L.	„	Do. do. P
„ <i>persica</i> ...	Mart.	„	Do. and rocks everywhere. P
„ <i>pullus</i> ...	L.	„	Do. do. do. P
„ <i>variegata</i> ...	Rve.	„	Mud flats at Maala. Scarce
„ <i>verrucosa</i> ...	Kien.	„	Dredged 5 to 7 fathoms in harbour. P
„ <i>Obockensis</i> , Jous.			
= <i>zailansis</i> .	Sowb.	„	Bunder Fookum Bay, L.S.T.
<i>Eburna Borneoensis</i> ...	Sowb.	„	Dredged 5 fathoms young P adult. R
„ <i>valentiana</i> ...	Swain.	„	Beach east of Isthmus washed up. P
<i>Purpura fasciata</i> ...	Dkr.	„	Rocks all round. P
„ <i>hippocastamum</i> ...	Lk.	„	Do. P
„ <i>mancinella</i> ...	L.	„	Do. MP
„ <i>sacellum</i> ...	Lk.	„	Do. MP
„ <i>persica</i> ...	L.	„	Do. P
„ <i>Rondolphi</i> ...	Chem.	„	Do. P
<i>Ricinula arachnoides</i> , var. <i>ricinus</i> .	L.	Aden	Rocks all round. P
„ <i>chrysostoma</i> .	Desh.	„	Do. in harbour. P
„ <i>elatum</i> ...	Blain.	„	Do. do. Scarce
„ <i>fiscellum</i> ...	Chem.	„	Do. do. P
„ <i>lobatus</i> ...	Blain.	„	Dredged dead and coral at SK Othman. R
„ <i>marginatum</i> - <i>altigona</i> .	Jous.	„	Rocks all round. P
„ <i>tuberculata</i> ..	Blain.	„	Do. P
<i>Rapana bulbosa</i> ...	Sol.	„	Maala mud flats, L.W.P.
<i>Coralliophila costularis</i> .	Lk.	„	Dredged 5 to 7 fms. Scarce
„ <i>violacea</i> ...	Kein.	„	Sk. Othman, coral. Do.
<i>Leptoconchus serratus</i> .	Rupell.	„	Sk. Othman, coral. R

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Magilus antiquus</i> ...	Mft.	Aden.	Buried in blocks of coral. Scarce
<i>Oliva bulbosa</i> ...	Jouss.	"	Berbera, L.W.S.T. Sandy bays near rocks. P
" <i>inflata</i> ...	Lk.	"	Do. do. do. VP
<i>Ancillaria albisculata</i> ...	Sowb.	"	Maala mud flats. MP
" <i>castanea</i> ...	"	"	Only one specimen, Maala mud flats.
" <i>exiguis</i> ...	"	"	Outer sea-shore all round. MP
" <i>fulva</i> ...	Swain.	"	Maala mud flats. P
<i>Fasciolaria trapezium</i> ...	L.	"	Rocks on sea face. P
<i>Latirus Forskali</i> ...	Canafri.	"	Rocks sea face everywhere. P
" <i>Pauluciae</i> ...	"	"	Sk. Othman, coral. Scarce
" <i>polygonus</i> ...	Gmel.	"	Rocks sea face everywhere. P
" <i>turritus</i> ...	"	"	Sk. Othman, coral.
<i>Turbinella cornifera</i> ...	Lk.	"	Rocks east of Isthmus. P
<i>Mitra affinis</i> ...	Rve.	"	Sk. Othman, coral. R
" <i>armilata</i> ...	"	"	Sifted from sand below Marbat. P
" <i>aureolata</i> ...	"	"	Sk. Othman, coral. R
" <i>bella</i> ...	A. Ad.	"	Do. do. R
" <i>Bovei</i> ...	Kein.	"	Do. do. R
" <i>circulata</i> ...	"	"	Dredged 5 to 10 fathoms P
" <i>coeligena</i> ...	Rve.	"	Rocks, L.W.S.T. MP
" <i>coniacea</i> ...	"	"	Do. do. MP
" <i>episcopalis</i> ...	L.	"	Dead specimens only.
" <i>ferruginea</i> ...	Lk.	"	Sk. Othman, coral. Scarce
" <i>fissurata</i> ...	"	"	Do. do. R
" <i>foviolata</i> ...	Dkr.	"	Do. do. R
" <i>fulvenscens</i> ...	Sowb.	"	Do. do. P
" <i>innesi</i> ...	Jouss.	"	Dredged 5 to 7 fathoms P
" <i>interlirata</i> ...	Rve.	"	Do. do. R
" <i>literata</i> ...	Lk.	"	Rocks Little Aden, L.W.S.T. P
" <i>lubeus</i> ...	Rve.	"	Sk. Othman, coral R
" <i>marginata</i> ...	Sowb.	"	Do. do. R
" <i>nebias</i> ...	Melvill.	"	Do. do. R
" <i>Pharaonis</i> ...	Ad.	"	Do. do. R
" <i>pretiosa-antoniae</i> ...	H. Ad.	"	Dredged outside Tarshyne 7 to 10 fathoms. P
" <i>rotundelirata</i> ...	Rve.	"	Sk. Othman, coral. R
" <i>rufescens</i> ...	A. Ad.	"	Dredged outside Tarshyne 7 to 10 fathoms. P
" <i>Scabriuscula</i> ...	Gray.	"	

G. and S. Names.	Author.	Habitat.	Remarks.
Mitra Shoplanti ...	Melvill.	Aden.	Coral at Sk. Othman. VR
" turgida ...	Rve.	"	Do. do. R
" variegata ...	"	"	Do. do. P
" vexillum ...	"	"	Do. do. MP
" valpecula ...	Lk.	"	Do. do. R
" ustulata ...	Rve.	"	Coral at Sk. Othman R
" xerampelina ...	Melvill.	"	Do. do. R
Marguiella gibbosa ...	Jouss.	"	Bunder, Fookum Bay, L.W. S.T. P
" obscura ...	Rve.	"	All outer bays.
" obtusa ...	Sowb.	"	Dredged 5 fathoms in harbour and Berbera, L.W.S.T. P
" scripta ...	Hinds.	"	Dredged 5 fathoms in harbour, only one specimen.
" terveriana .	Petit.	"	All outer bays. P
" verdensis .	Smith.	"	Do. P
Columbella albina ...	Kein.	"	Sk. Othman, coral. Scarce.
" albinodulosa.	Gask.	"	Rocks in all bays. P
" aspersa ...	Sowb.	"	Sk. Othman, coral. R
" astricta ...	Rve.	"	Do. do. R
" alveolata ...	Kein.	"	Telegraph Bay sifted from sand. R
" conspersa ...	A. Ad.	"	Sk. Othman, coral. R
" cribraria ...	Lk.	"	Rocks in all bays. P
" fabula ...	Rve.	"	Sappers Bay, one dead specimen.
" flava ...	Brug.	"	Rocks LittleAden, L.W.S.T.P
" Hanleyi ...	Dsh.	"	Sappers Bay, one dead specimen.
" ligula ...	Dull.	"	Sifted from sand, Steamer Point to Maala near rocks. P
" lyrata ...	Sowb.	"	Do. do. Scarce
" mendicaria .	L.	"	Rocks everywhere, L.W. P
" mercatoria..	L.	"	Sk. Othman, coral, only one dead specimen.
" misera ...	Sowb.	"	Rocks everywhere, L.W. P
" propinqua ...	Smith.	"	Rocks LittleAden, L.W.S.T. P
" zonata ...	Rve.	"	Little Aden and most rocky bays. P
Harpa ventricosa ...	...	"	Isthmus mud flats. R
Cassis fauroti ...	...	"	Isthmus mud flats, one specimen. R
" pila ...	Rve.	"	

G. and S. Names.	Author.	Habitat.	Remarks.
Cassis rufa ...	L.	Aden.	Little Aden reefs. R
" vibex ...	"	"	Do. R
Dolium quemanju ...	...	"	Sk. Othman, coral, only one dead specimen.
Natica cernica ...	Jouss.	"	Rocks on islands in harbour, L.W.S.T. P
" chinensis ...	Lk.	"	Dredged 5 to 7 fathoms in harbour. R
" Collei ...	Recluz.	"	Do. do. do. R
" didyna ...	Bolt.	"	Do. do. Adult specimens scarce.
" Forskali ...	Chem.	"	Rocks on island in harbour. R
" maculosa ...	L.	"	Dredged 5 fathoms and Maala mud flats. R
" mamilla ...	L.	"	Mud flats steamer to Maala P
" marocana ...	Chem.	"	Do. do. P
" melanostoma ...	Sk.	"	Sk. Othman, coral. R
" plicatula ...	Nutt.	"	Rocks on islands in harbour. P
" pulicaria ...	Philipi.	"	Dredged in 5 fathoms harbour adult specimens scarce.
" simiæ ...	Chem.	"	Little Aden. R
" tæniata ...	Nunke.	"	Telegraph and Gold Mohur Bays. Scarce.
Natacina papilla ...	Gmel.	"	Dredged 5 to 7 fathoms in harbour. R
Sigaretus planulatus ...	Recluz.	"	Isthmus sea face. Scarce.
Sealaria clathrus ...	L.	"	Rocks Gold Mohur Bay, one adult specimen.
" decussata ...	Lk.	"	Isthmus sea face, two dead specimens.
Terebra albomarginata.	Desh.	"	Dredged 5 to 7 fathoms in harbour. R
" Babylonica ...	"	"	Do. do. do. and mud flats, L.W.S.T., Scarce
" coerulescens ...	Lk.	"	Telegraph Bay. P
" consobrina ...	Desh.	"	Maala mud flats, one dead specimen.
" gotoensis ...	Smith.	"	Dredged 5 to 8 fathoms off Tarshyne. R
" Lamarekii ...	Kien.	"	All mud flats, L.W.S.T. P
" nassoides ...	Hinds.	"	Dredged off Tarshyne, Scarce
" Souleyeti ...	Desh.	"	Do. R

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Terebra straminea</i> , var. <i>serotina</i> .	Ad.&Rve.	Aden.	Dredged off Tarshyne and in Berbera. P
" <i>tessellata</i> ...	Gray.	"	Dredged 5 to 7 fathoms harbour and Steamer Point to Maala. S
<i>Pyramidella mitralis</i> ...	A. Ad.	"	Dredged off Tarshyne. R
" <i>Pratii</i> ...	Born.	"	Do. R
" <i>variegata</i> ...	A. Ad.	"	Do. R
<i>Obeliscus dolabratus</i> ...	L.	"	Do. Scarce
<i>Eulima arenata</i> ...	Sowb.	"	Do. Do.
" <i>brevis</i> ...	"	"	Do. R
<i>Solarium cylindraceum</i>	Chem.	Aden.	Dredged 5 to 7 fathoms in harbour. R
" <i>dorsuorum</i> ...	Hinds.	"	Do. do. Scarce
" <i>(Philippia)</i> <i>hybridum</i> .	L.	"	Do. do. Do.
" <i>laevigatum</i> ...	Lk.	"	Dredged off Tarshyne. Large specimens scarce
" <i>perspectivum</i>	L.	"	Mud flats, Isthmus. P
" <i>perspectivincula</i> .	Chem.	"	Steamer Point to Maala. P
" <i>regium</i> ...	Hanley.	"	Isthmus mud flats. R
" <i>variegatum</i> ...	Gmel.	"	Steamer Point to Isthmus, L.W.S.T. Scarce
<i>Conus acuminatus</i> ...	Hwass.	"	Maala mud flats. P
" <i>adenensis</i> ...	Smith.	"	Isthmus sea face, 4 dead specimens only.
" <i>adansonii</i> ...	Lk.	"	Rocks outer sea face. MP
" <i>arenatus</i> ...	Hwass.	"	Steamer Point to Maala. P
" <i>betulinus</i> ...	L.	"	Telegraph Bay and Little Aden. L.W.S.T. P
" <i>bullatus</i> ...	"	"	Berbera. R
" <i>catus</i> ...	Hwass.	"	Rock on islands in harbour. P
" <i>cæpitanæus</i> ...	L.	"	Dead specimens only, Isthmus sea face. R
" <i>cuvieri</i> ...	Crosse.	"	Islands in harbour, Steamer Point. P
" <i>erythræensis</i> ...	Beck.	"	Steamer Point to Maala, L. W. P
" var. <i>adustus</i> ...	Sowb.	"	Steamer Point to Maala. Scarce
" <i>flavidus</i> ...	Lk.	"	Holkart's Bay. P
" <i>fumigatus</i> ...	Hwass.	"	Dredged in harbour. Good specimens scarce

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Conus generalis</i> ...	L.	Aden.	Dredged off Tarshyne. R
" <i>geographus</i> ...	"	"	Sk. Othman, coral. R
" <i>gemmulatus</i> ...	Sowb.	"	Bulhar, only one specimen.
" <i>inscriptus</i> ...	...	"	Maala mud flats and var. Gold
			Mohur Bay, L.W.S.T.
" <i>lividus</i> ...	Chem.	"	Holkart's Bay, L.W.S.T. P
" <i>lineatus</i> ...	...	"	Off M.M. coal depot. Scarce
" <i>luctificus</i> ...	...	"	Bunder Fookum Bay reefs
			L.W.S.T. Scarce
" <i>miles</i> ...	L.	"	Dead specimens, Isthmus sea-
			face. R
" <i>minimus</i> ...	"	"	Rocks everywhere. VP
" <i>nussatella</i> ...	"	"	Maala mud flats. Scarce
" <i>nemocamus</i> ...	Hwass.	"	Do. P
" <i>pusillus</i> ...	Chem.	"	Rocks outer sea face, L.W.V.P
" <i>quercinus</i> ...	Hwass.	"	Steamer Point to Maala, L.
			W.S.T. P
" <i>quadratamacula-</i> <i>tus.</i>	Sowb.	"	Bulhar dredged 10 fathoms R
" <i>splendidulus</i> ...	"	"	Bunder Fookum reefs. R
" <i>striatus</i> ...	L.	"	Little Aden. R
" <i>Sumatrensis</i> ...	Lk.	"	Rocks outer sea face all parts.
			L.W. P
" <i>tæniatus</i> ...	Hwass.	"	Do. do. do. VP
" <i>tesselatus</i> ...	Born.	"	Off Tawai, L.W.S.T. Scarce
" <i>textile</i> ...	L.	"	Rocks outer sea face. P
" <i>Thomasi</i> ...	...	"	Do. do. P
" <i>traversianus</i> ...	Smith.	"	Dredged off Tarshyne, good
			specimen. VR
<i>Strombus cylindricus</i> ..	Swain.	"	Steamer Point to Maala,
			L.W. P
" <i>dentalus</i> ...	L.	"	Do. do. R
" <i>floridus</i> ...	Lk.	"	Do. do. P
" <i>fusiformis</i> ...	Sowb.	"	Steamer Point to Maala,
			L.W.S.T. Scarce
" <i>gibberulus</i> ...	L.	"	Steamer Point to Maala,
			L.W. P
" <i>lineatus</i> ...	Lk.	"	Perim, 2 specimens only
			dredged in harbour.
" <i>mauritiana</i> ...	Lk.	"	Gold Mohur Bay, young spe-
			cimen only. R
" <i>plicatus</i> ...	Lk.	"	Steamer Point to Maala. P
" <i>Roupelli</i> ...	Rve.	"	Do. do. P

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Strombus tricornis</i> ...	Lk.	Aden.	Mud flats at Maala, L.W.S.T. P
„ <i>variabilis</i> ...	Swain.	„	Mud flats at Maala and Isthmus, L.W.S.T. P
„ <i>urceus</i> ...	L.	„	Do. do. R
<i>Rostellaria curta</i> ...	Sowb.	„	Maala mud flats. R
„ <i>curvirostris</i>	Lk.	„	Do. P
<i>Cypræa annulus</i> ...	L.	„	Rocks outer sea face, L.W. P
„ <i>Arabica</i> ...	„	„	Do. everywhere, L.W. VP
„ <i>cameoleopardalis</i> - <i>melanostoma</i>	„	„	Isthmus, dead specimen.
„ <i>caurica</i> ...	L.	„	Rocks round islands, L.W. P
„ <i>carneola</i> ...	Mart.	„	Do. everywhere, L.W. P
„ <i>clandestina</i> ...	L.	„	Sk. Othman, coral. P
„ <i>crucata</i> ...	Gmel.	„	Islands in harbour, L.W.S.T. P
„ <i>var. coloba</i> ...	Melvill.	„	Do. do. R
„ <i>erosa</i> ...	L.	„	Rocks everywhere, L.W. VP
„ <i>erythræensis</i> ...	Beck.	„	Sk. Othman, coral. Scarce
„ <i>exusta</i> ...	Sowb.	„	Do. R
„ <i>felina</i> Gray- <i>fabula</i>	Kein.	„	Rocks all round, L.W.S.T. P
„ <i>fimbriata</i> ...	Gmel.	„	Do. do. VP
„ <i>var. macula</i> ...	Adams.	„	Do. do. P
„ <i>gangrenosa</i> ...	Sol.	„	Do. do. Scarce
„ <i>helvola</i> ...	L.	„	Do. do. R
„ <i>histrion</i> ...	Gmel.	„	Do. do. P
„ <i>isabella</i> ...	L.	„	Do. do. R
„ <i>lentiginosa</i> ...	Gray.	„	Dredged 5 fathoms, 2 specimens harbour.
„ <i>Listeri</i> ...	Gray.	„	Island in harbour, 2 specimens only.
„ <i>lynx</i> ...	L.	„	Island in harbour and Maala, L.W.S.T. P
„ <i>Lienardi</i> ...	Jouss.	„	Sk. Othman, coral. P
„ <i>mauritiana</i> ...	L.	„	Perim Rocks and outer sea-face MP
„ <i>moneta</i> ...	„	„	Do. do. MP
„ <i>nucleus</i> ...	„	„	Sk. Othman, coral. Scarce
„ <i>ocellata</i> ...	„	Berbra	One specimen only, L.W.S.T.
„ <i>pantherina</i> ...	Sol.	Aden	Fisherman's Bay, L.W.S.T. P
„ <i>pulchra</i> ...	Swain.	„	Do. do. P
„ <i>punctata</i> ...	L.	„	Sk. Othman, coral. R

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Cypræa staphylea</i> ...	L	Aden.	Sk. Othman, coral. R
<i>talpa</i> ...	"	"	Do. do. R
<i>tigris</i> ...	"	"	Fisherman's Bay, L. W. S. T. R
<i>turdus</i> ...	Lk.	"	Everywhere at L. W. S. T. VP
<i>Turneri</i> ...	Jouss.	"	Sk. Othman, coral. MP
<i>undata</i> ...	Lk.	"	Do. do. R
<i>vitellus</i> ...	L.	"	Do. do. R
<i>zigzac</i> ...	"	"	Steamer Point to Maala under Rocks, L.W.S.T. R
<i>Ovulum lacteum</i> ...	Lk.	"	Sk. Othman coral. R
<i>(birostitia) spelta</i>	L.	"	Do. R
<i>Cancellaria elegans</i> ...	Sowb.	"	Dredged 5 to 7 fathoms harbour. R
<i>hystrix</i> ...	Rve.	"	Do. do. MP
<i>melanostoma</i> ...	Sowb.	"	Bunder Fookum Bay. R
<i>scalarina</i> ...	Lk.	"	Dredged in harbour 5 to 7 fathoms. MP
<i>Cerethium asper</i> ...	L.	"	Sk. Othman. R
<i>bifasciatum</i> ...	Sowb.	"	Bunder Fookum Bay, L.W. S.T. R
<i>clypeomorus</i> ...	Jouss.	"	Steamer Point, harbour shore L.W. P
<i>cæruleum</i> ...	Sowb.	"	All sandy beaches near rocks, L.W.S.T. R
<i>columna</i> ...	"	"	All sandy beaches near rocks, L.W.S.T. P
<i>contractum</i> ...	"	"	Bunder Fookum Bay, L.W. S.T. R
<i>echinatum</i> ...	Lk.	"	Do. do. R
<i>fasciatum</i> ...	Mart.	"	Sappers' Bay and dredged in 5 fathoms harbour. P
<i>fluvialis</i> ...	Pd. Mich	"	Mud flats, Little Aden. P
<i>kochii</i> ...	Phil.	"	Dredged in 5 to 7 fathoms in harbour. P
<i>lacteum</i> ...	Kien.	"	Do. do. P
<i>vertagus-fasciatus</i>	Brug.	"	Little Aden, L.W.S.T. R
" <i>obeliscus</i> ...	"	"	All parts, L. W. VP
<i>var. cedo-nulli</i> ...	Sowb.	"	Do. do. VP
<i>pingue</i> ...	A. Ad.	"	Bunder Fookum Bay, L.W. S.T. R

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Cerethium recurvum</i> .	Sowb.	Aden.	Sandy bays all round L.W. P
„ <i>Roupelli</i> ...	...	„	Do. do. L.W. P
„ <i>tuberculatum</i> .	L.	„	All sandy beaches L.W.S.T. VP
„ <i>yerburi</i> ...	Smith.	„	Do. do. do. VP
<i>Littorina ahenea</i> ...	Rve.	„	Berbera.
„ <i>granocostata</i> ...	„	„	Bunder Fookum Bay, L.W. VP
„ <i>natalensis</i> ...	Kraus.	„	Do. do. VP
<i>Modulus candidus</i> ...	Petit.	„	Dredged in harbour 5 to 7 fathoms, only 2 dead specimens.
„ <i>textum</i> ...	Gmel.	„	Dredged in harbour 5 to 7 fathoms, only 2 dead specimens. R
<i>Planaxis breviculus</i> ...	Desh.	„	All rocks on sea face. VP
„ <i>Savignyi</i> ...	A. „	„	Do. do. VP
<i>Rissoina clathrata</i> ...	A. Ad.	„	Sifted from sand, Sappers' Bay.
„ <i>cocinna</i> ad-	Recluz.	„	Do. do. Scarce
„ <i>emporides</i> .	Issol.	„	Do. do. Do.
„ <i>sidmondiana</i> .	Sowb.	„	Do. do. P
„ <i>spirata</i> ...	„	„	Do. do. R
„ <i>tridentata=curta</i>	„	„	Dredged off Tarshyne, 6 fathoms. V P
<i>Turritella columnaris</i> .	Kien.	„	Dredged off from Tarshyne to Maala, L.W.S.T. P
„ <i>maculata</i> ...	Rve.	„	
<i>Phorus</i> ...	...	„
<i>Calyptræa æquestris</i> ...	L.	„	Maala and Isthmus Rocks, L.W. Scarce
„ <i>cicatrosa</i> ...	Rve.	„	Do. do. Do.
<i>Narica cancellata</i> ...	Chem.	„	Isthmus Rocks, both sides. R
<i>Nerita chrysostoma</i> ...	Richy.	„	Little Aden, L.W.S.T. P
„ <i>plexa</i> ...	Chem.	„	Do. do. Scarce
„ <i>polita</i> ...	L.	„	Rocks everywhere, L.W. VP
„ <i>Rumphii</i> var ...	Recluz.	„	Do. do. VP
<i>Phasianella lineolatus</i> ..	Wood.	„	Bunder Fookum Bay, L.W. S.T. R
„ <i>nivosa</i> ...	Rve.	„	Do. do. R
<i>Turbo coronatum</i> , var.	...	„	
„ <i>granulatum</i> ...	Gmel.	„	Rocks everywhere, L.W. VP
„ <i>elegans</i> ...	Phil.	„	Do. do. P

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Turbo pethiolatus</i> ...	L.	Aden	Rocks Isthmus sea face. R
„ <i>pustulata</i> ...	Broedii.	„	Do. do. Scarce, P
„ <i>radiata</i> ...	Gmel.	„	Do. everywhere. P
<i>Leptothyra læta</i> ...	Montr.	„	
<i>Trochus cardinalis</i> vir- gata	Gmel.	„	Sk. Othman, coral. R
„ <i>infundibulum</i> , var. <i>erythraeus</i> ...	Brochi.	„	Rocks everywhere, L.W. P
<i>Clanculus Pharaonis</i> ...	L.	„	Do. do. P
<i>Monodonta dama</i> ..	Phil.	„	Sappers' Bay Rocks, L.W.S. P
„ <i>obscurus</i> ...	Wood.	„	Sappers' Bay sand. P
<i>Eucellus bicinctus</i> ...	Phil.	„	Sifted Sappers' Bay sand, L.W.S.T. P
„ <i>delpretei</i> ...	Caram.	„	Do. do. P
„ <i>proximus</i> ...	A. Ad.	„	Rocks Steamer Point to Maala, L.W. P
<i>Zizyphinus scobinatus</i>	A. Ad.	„	Dredged 5 to 7 fathoms in harbour. P
<i>Gibbula doriae</i> ...	Caram.	„	Sifted from sand, Sappers' Bay. P
<i>Minolia caiffassei</i> ...	Caram.	„	Do. do. P
<i>Margarita variabilis</i> ...	A. Ad.	„	Do. do. R
<i>Haliotis</i> ...	...	„	Rocks Isthmus sea face. R
<i>Fissurella kuppelli</i> ...	Sowb.	„	Rocks everywhere, L.W. P
<i>Parmophorus unguis</i> ...	L.	„	Gold Mohur Bay R
<i>Dentalium Shoplandi</i> ...	Jouss.	„	Dredged 670 fathoms by Tel. Str. Amber 50 miles E. Aden.
<i>Patella plumbea</i> ...	Lk.	„	Rocks outer sea face P
„ <i>radians</i> ...	Gmel.	„	Do. do. P
<i>Somatella solidula</i> ...	L.	„	Berbera and Perim dredged 5 to 7 fathoms P
<i>Bulla ampulla</i> ...	L.	„	Steamer Point to Maala, L.W.S.T. P
„ <i>physis</i> ...	Lk.	„	Isthmus mud flats. P
„ <i>vexillum</i> ...	...	„	Do. R
<i>Atys cylindracea</i> ...	Helb.	„	Dredged 5 to 7 fathoms in harbour. P
„ <i>naucum</i> ...	L.	„	Do. do. P
<i>Umbrella Indica</i> ...	Lk.	„	Near M.M. Coal Depot R

G. and S. Names.	Author.	Habitat.	Remarks.
BIVALVES.			
Martesia striata ...	L.	Aden.	Mud flats at Maala in soft rock. P
Solen corneus ...	Lk.	"	Isthmus sea face, L.W. P
" d ...			.....
" Gouldii ...	Conrad.	"	Do. do. P
" truncatus ...	Wood.	"	Do. do. P
Machæra polita, Wood,			
var. japonica ...	Dkr.	"	Do. do. VP
Tugonia nobilis ...	A. Ad.	"	Do. do. alive. R
Corbula Leahitriensis...	Lk.	"	Rocks near Isthmus. P
Anatina hispidula ...	Val.	"	Dredged 5 to 7 fathoms in harbour. Scarce
Thracia Australica ...	Rve.	"	Dredged 5 to 7 fathoms, only one specimen.
Pandora ...	...		.....
Maetra achatina ...	Chem.	"	Dredged Bunder Fookum Bay. VR
" crista ...	Jouss.	"	Isthmus sea face, L.W.S.T. R
" decora ...	Desh.	"	Do. do. Scarce
" fauroti, var. alba	Jouss.	"	Do. do.
" famoh ...	"	"	Do. do.
Lutraria cultellus ...	L.	"	Isthmus sea face, dead specimens. R
" intermedia ...	Desh.	"	Do. do.
Standella Egyptica ...	Chem.	"	Maala mud flats. R
" solandri ...	Gray.	"	Do. R
Ræta abercrombiei ...	Melvill.	"	Isthmus sea face, odd valves only. P
Cæcilla zebuensis ...	Desh.	"	All sandy bays, L.W. P
Asaphis deflorata ...	L.	"	Sappers' Bay L.W. P
Psamobia elegans ...	Desh.	"	Little Aden. R
" marmorea ...	"	"	Do. R
" occident ...	Chem.	"	Do. R
" pallida ...	Desh.	"	Do. R
" Weinkauffi...	Crosse.	"	Gold Mohur Bay cast up dead. R
Soletellina adamsi ...	Desh.	"	Maala mud flats, L.W. R
Tellina Adenensis ...	Smith.	"	Isthmus sea face. MP
" concentrica ...	Gould.	"	Steamer Point, harbour shore L.W.S.T. Scarce.

G. and S. Names.			Author.	Habitat.	Remarks.
Tellina coxa ...	...	Jouss.	Aden.	Steamer Point, harbour shore L.W.S.T.	Scarce.
" dubia ...	...	Desh.	"	Do. do.	R
" edentula ...	...	Spengl.	"	Isthmus sea face.	L.W.S.T.
" foliacea ...	...	L.	"	Isthmus sea face.	
" lacumniosa ...	...	Chem.	"	Steamer Point to Maala, L.W.S.T., dead only.	P
" ostracea ...	...	Lk.	"	Isthmus sea face	R
" Pharaonis ...	...	Hanley	"	Do. do.	R
" rubella ...	...	Desh.	"	Dredged 5 fathoms inner har- bour.	P
" rugosa ...	...	Bom.	"	Maala mud flats, L.W.S.T.	R
" scobinata ...	...	L	"	Do.	Scarce.
" staurella ...	...	Lk.	"	Isthmus sea face.	R
" subpallida ...	...	Smith.	"	Do.	Scarce.
" sulcata ...	...	Wood.	"	Steamer Point to Maala L.W.S.T.	MP
" perplexa ...	...	Hanley.	"	Sk. Othman, coral.	R
Donax erythraea ...	...	Bertram.	"	Sands Bunder Fockum Bay L.W.S.T.	P
" scalpellum ...	...	Gray.	"	Sands Little Aden, L.W. S.T.	Scarce.
" clathrata ...	...	Reese.	"	Isthmus sea face, L.W.S.T.	P
Scrobicularia vaillanti.	...	Jouss.	"	Do. do.	R
Semele chinensis ...	...	A. Ad.	"	Rocks Isthmus, L.W.S.T.	P
" cruenta ...	...	Ad&Ang.	"	Dredged 5 fms. harbour	R
" lamellosa ...	...	Sowb.	"	Do. do.	R
Paphia glabrata ...	...	Desh.	"	Isthms sea face.	R
Tivela ponderosa ...	...	Koch.	"	Do.	R
Meretrix lusoria ...	...	Chem.	"	Do.	R
Callista costata ...	...	"	"	.....
" erycina ...	...	L.	"	Berbera Isthmus mud flats, L.W.S.T.	R
" florida ...	...	Lk.	"	.....
" umbonella ...	...	"	"	Maala and Isthmus mud flatr. L.W.S.T.	P
" lilacina ...	...	Lk.	"	Do. do.	P
Caryatis varians ...	...	Hanley.	"	.....
Lioconcha hebroea ...	...	Lk.	"	Dredged off Tarshyne, 5 to 7 fathoms	R
" tigrina ...	...	"	"	Do. do. do.	R
Circe Arabica... ..	...	Chem.	"	.....
" callypiga ...	...	Bom.	"	All mud flats, L.W.S.T.	P

G. and S. Names.		Author.	Habitat.	Remarks.		
Circe	corrugata	...	Chem.	Aden.	Dredged in harbour, 5 to 7 fathoms	Scarce.
"	intermedia	...	Rve.	"	Steamer Point to Isthmus mud flats, L.W.S. T.	MP
"	leutiginosa	...	Chem.	Aden	Maala mud flats, L. W. S. T.	P
"	pectinata	...	L.	"	Do.	do. P
"	scripta	...	"	"	Dredged off Tarshyne 5 to 10 fathoms.	P
"	do. var. fulgurata	...	Rve.	"	Do.	do. R
Sunetta	contempta	...	Smith.	"	Gold Mohur Bay.	R
"	intermedia	...	.....	"	Do.	R
Tapes	deshayesi	...	Hanley.	"	Bunder Fookum Bay, dredged 6 fathoms.	VR
"	florida var.	...	Lk.	"	Dredged off Flint Island.	P
"	litterata	...	L.	"		
"	malabaricus	...	Chem.	"	Steamer Point to Isthmus mud flats, L.W.	P
"	obscurata	...	Desh	"	Dredged 5 fathoms harbour.	R
"	pinguis	...	Chem.	"	All mud flats, L.W.S.T.	VP
"	radiata	...	Gmel.	"	Do.	do. P
"	sulcosa	...	Lk.	"	Sk. Othman.	R
"	textrix	...	Chem.	"	Dredged in harbour 5 to 7 fathoms.	P
Anaitis	foliacea	...	Philippi.	"	Do.	do. P
Chione	crispata	...	Desh.	"	Do.	do. R
"	Lamarckii	...	Gray.	"	Do.	do. R
"	lamellosa	...	Chem.	"	Do.	do. R
Dosinia	alta	...	Dkr.	"	Isthmus sea face, L.W.S.T.	P
"	hepatica	...	Lk.	"	Do.	do. P
"	histrio	...	Gmel.	"	Do.	do. P
"	pubescens	...	Phil.	"	Do.	do. VP
Venerupis	macrophylla.	...	Desh.	"	Isthmus mud flats, L.W.S.T., near rocks.	P
"	claudiconitra madreporica.	...	Jouss.	"	Do.	do. P
Cypriocardia	coralliophaga.	...	Lk.	"	Sk. Othman, coral.	P
Coralliophaga	coralliophagus.	...	Jouss.	"	Do.	do. P
Petricola	hemprichii...	...	Issol.	"	Do.	do. P
Choristodon	lapicidum.	...	Chem.	"	Sk. Othman, coral.	Scarce

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Cardium assimile</i> ...	Rve.	"	Steamer Point harbour shore, L.W.S. T. Scarce
" <i>australi</i> Sowb.== <i>pulchrum</i> .	"	"	Dredged 5 to 7 fathoms in harbour. P
" <i>latum</i> = <i>cetosum</i> .	Redfield.	"	Steamer Point to Maala. Scarce
" <i>pseudolima</i> ...	Lk.	"	Dredged 5 fathoms harbour. VR
" <i>rugosum</i> ...	"	"	Off Post Office, L.W.S.T. P
" <i>rubicundum</i> var.	...	"	Do. do. R
<i>Chama fragum</i> ...	Rve.	"	Dredged off Tarshyne 6 fathoms. P
" <i>gryphoides</i> ...	L.	"	Do. do. P
<i>Tridacna crocea</i> var. ...	Lk.	"	Sk. Othman coral. R
<i>Lucina dentifera</i> ...	Jouss.	"	Maala mud flats. Scarce
" <i>exasperata</i> ...	Rve.	"	Do. Do.
" <i>semiporiana</i> ...	Issol.	"	Sappers' Bay Sand. P
<i>Diplodonta rotundata</i> .	Turton.	"	Isthmus sea face, L.W.S.T. P
<i>Scintilla obockensis</i> ...	Jouss.	"	Do. do. R
" <i>faba</i> ...	Desh.	"	Do. do. P
<i>Crassatella radiata</i> ...	Sowb.	"	Dredged off Tarshyne, 5 to 7 fathoms. P
<i>Cardita antiquata</i> ...	Poli.	"	Steamer Point to Maala. Good specimens scarce
" <i>semi-orbiculata</i> .	L	"	Isthmus sea face, L.W.S.T. P
" <i>sulcata</i> ...	Lk.	"	Steamer Point to Maala mud flats. P
" <i>variegata</i> ...	Brug.	"	Do. do. do. P
<i>Mytilicardia gubernaculum</i> .	Rve.	"	Rocks at Isthmus sea face, L.W. P
<i>Mytellus pictus</i> ...	Bom.	"	Off buoys and vessels in harbour. P
<i>Crenella cummingii</i> ...	Drk.	"	Isthmus sea face. R
<i>Modiola auriculata</i> ...	Kraus.	"	Do. R
" <i>Sirhoensis</i> ...	Jouss.	"	Do. R
<i>Lithodomus erythræensis</i> .	"	"	Sk. Othman, coral. P
" <i>lithophagus</i> .	Lk.	"	Do. do. P
" <i>cinnamoneanus</i> var.	"	"	Do. do. P

G. and S. Names.	Author.	Habitat.	Remarks.
Septifer excisus ...	Weighman.	"	Rocks all round, L.W.S.T. P
Avicula marmorata ...	Rve.	"	Off vessels and buoys. Good specimens rare.
Maleagrina margaritifera.	L.	"	Flint Island, L.W.S.T. Large specimens scarce
Maleus albieus ...	Jouss.	"	Dredged in 5 to 7 fathoms off Tarshyne.
Crenatula picta ...	Gmel.	"	Isthmus, sea face, only one specimen
Pinna altor ...	Sowb.	"	Islands in L.W.S.T. Scarce
" bicolor ...	Chem.	"	Do. do. MP
" nigra ?	...	"	Military Pier to Tawai-Tides only. MP
Arca clathrata ...	Rve.	"	All mud flats. P
" domingensis ...	Lk.	"	Rocks everywhere, L.W.S.T. P
" imbricata ...	Brug.	"	Do. do. P
" natalensis ...	Kraus.	"	Do. do. P
" navicularis ...	Brug.	"	Sk. Othman, coral. R
" obliquata ...	Wood.	"	Rocks, Maala and Isthmus, L.W.S.T. P
" tortuosa ...	L.	"	Dredged 5 to 7 fathoms in harbour. P
" scapha ...			
Cuculea concamerata...	Martini.	"	Sk. Othman, coral. R
Pectunculus pecteniformis.	Lk.	"	Maala mud flats near rocks. Scarce
Pectunculina multi-stricta.	Sowb.	"	Dredged off Tarshyne and at Bulhar, 7 to 12 fathoms
Pecten flabeloides ...	Rve.	"	Isthmus mud flats, L.W.S.T. VR
" layardi, var. ...	Rve.	"	Marbat to P.O. Pier. L.W.S.T. R
" luculentus, var..	"	"	Do. do. R
" plica ...	L.	"	Isthmus mud flats, L.W.S.T. R
" sanguinolentus .	Gmel.	"	Sk. Othman coral, only two specimens.

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Pecten senatorius</i> ...	Gmel.	"	Steamer Point to Maala, attached to rocks and piers, L.W. P
" <i>squamosus</i> , var. <i>lividus</i> .	Lk.	"	Steamer Point to Maala attached to rocks and piers, L.W. P
" <i>Townsendi</i> ...	Sowb.	"	Bunder Fookum Bay and African Coast, L.W.S.T. R
" <i>Tranquebaricus</i> ..	Gmel.	"	Rocks and islands in har- bour, L.W.S.T. R
<i>Lima paucicostata</i> ...	Sowb.	"	Sk. Othman, coral. R
" <i>scabra</i> ...	Born.	"	Do. do. R
<i>Plicatula imbricata</i> ...	Menke.	"	Rocks on islands in harbour.
<i>Pedum spondylioidum</i> ...	Lk.	"	Rocks on mud flats. R
<i>Anomia achæus</i> ...	Gray.	"	Attached to other shells. P
<i>Placuna placentis</i> ...	L.	"	Maala and Isthmus mud flats, L.W.S.T. R
<i>Vulsella linguafelis</i> ...	Roe.	"	Steamer Point to Maala in sponge. P
<i>Ostrea crista galli</i> ...	L.	"	In Cave in Islands Bunder Fookum Bay. M.P
" <i>hyotis</i> ...	"	"	Reef, Bunder Fookum Bay, L.W.S.T. P
" <i>Sueli</i> ...	"	"	Do. do. P
<i>Lingula anatina</i> ...	Lk.	"	Dug out of sand, L.W.S.T., Isthmus. P

DESCRIPTION OF A NEW EARTH-SNAKE FROM TRAVANCORE (*RHINOPHIS FERGUSONIANUS*).

BY G. A. BOULENGER, F.R.S.

(With a Plate.)

(Read before the Bombay Natural History Society, 14th January, 1896.)

The genus *Rhinophis*, of which five Ceylonese species are known, was for many years believed to be represented in Southern India by two species, viz., *R. melanogaster*, Gray, and *R. sanguineus*, Beddome. In 1886 Colonel Beddome pointed out that the former had no right to remain in that genus and correctly transferred it to the genus *Silybura*, to which the bulk of Indian Uropelets belong. Therefore, when in 1890 I revised the list of Indian Snakes, the genus *Rhinophis* was reduced to one continental species, *R. sanguineus*. But shortly after I had the pleasure of adding a second, described in this Journal in 1893, *R. travancoricus*,* of which a specimen from Trivandrum had been sent to me by Mr. H. S. Ferguson. Thanks to the same gentleman, I am now able to describe a third species, nearest allied to the Ceylonese *R. trevelianus*, with which I am happy to connect the name of Mr. Ferguson, to whose exertions we owe several interesting additions to the herpetological fauna of Travancore.

Rhinophis fergusonianus, n. sp.

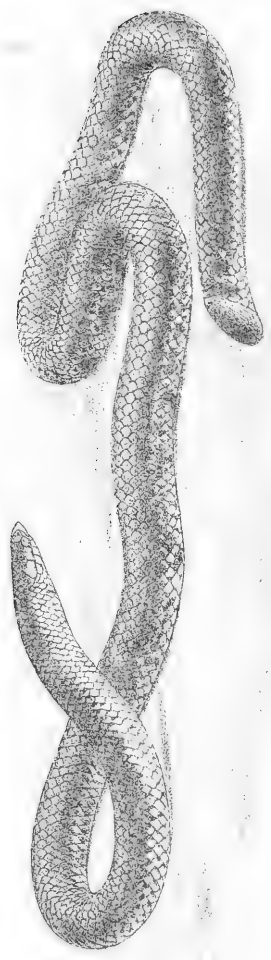
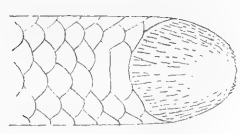
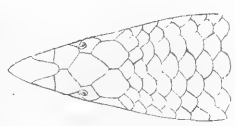
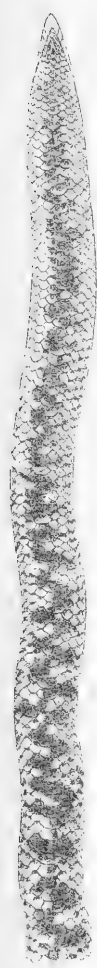
Snout acutely pointed; rostral very obtusely keeled above, two-fifths the length of the shielded part of the head; frontal a little longer than broad, shorter than the paritals; eye very small, not half as long as the ocular shield, in contact with the third labial. Diameter of body, 40 times in the total length; 17 scales round the middle of the body, 19 behind the head; ventrals only a little larger than the adjacent scales, 184; subcaudals 4, caudal disk a little longer than the shielded part of the head, scarcely visible from below; longitudinally striated, blackish above; sides white, dotted and spotted with black; belly white, with black dots and two series of large black spots partially confluent into a zigzag band; caudal disk black, edged all round with yellow.

Total length, 320 millim.

A single specimen from the Cardamom hills, collected by Mr. J. S. Sealy.

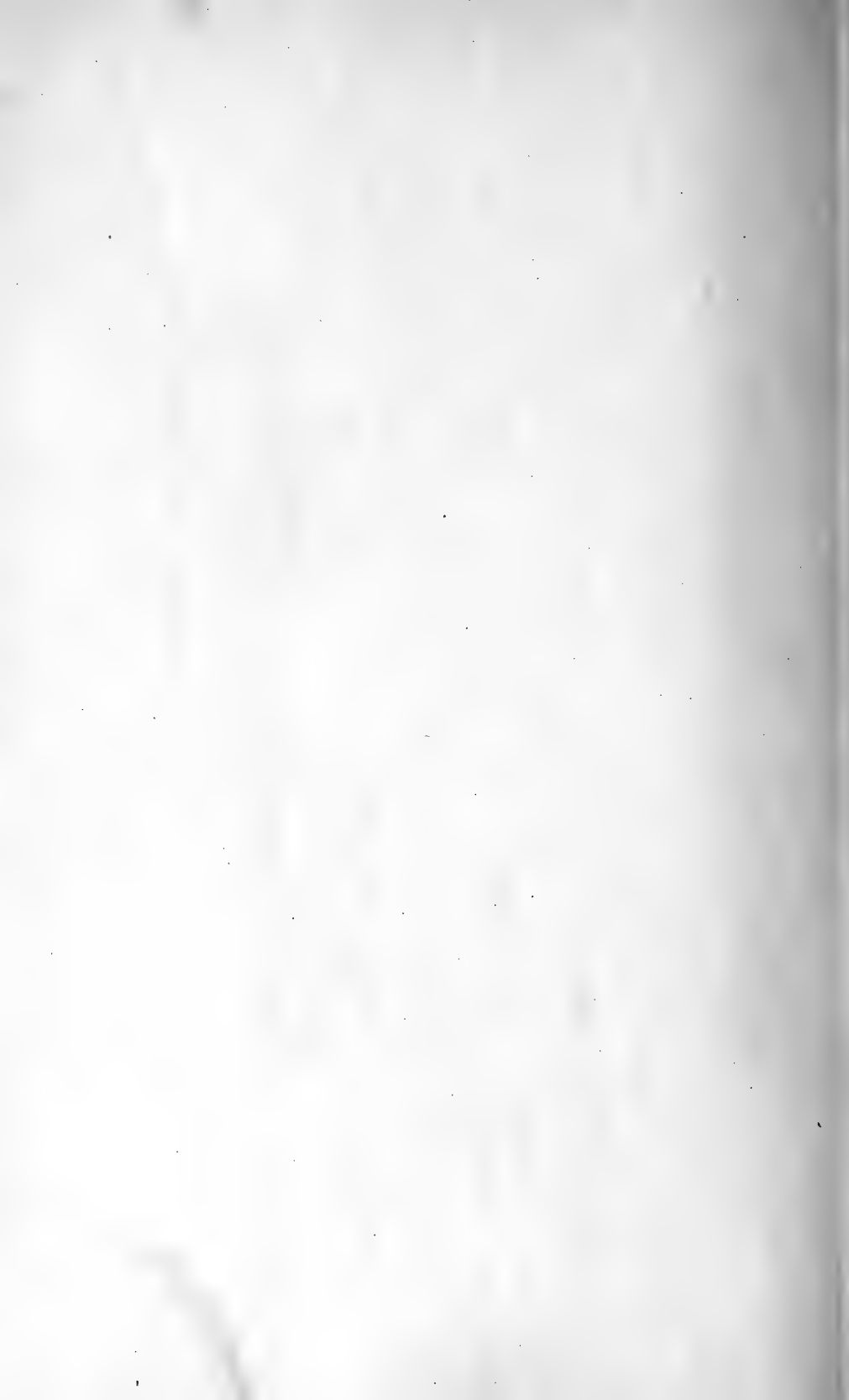
Differs from *R. trevelianus* in the more slender body, and the longer caudal disk, which does not extend on the lower surface of the tail, and is striated instead of granulate.

* See Vol. VII, page 318.



RHINOPHIS FERGUSONIANUS.
(A new Earth-Snake from Travancore.)

Mintern Bros. del et lith. London.



THE BUTTERFLIES OF THE NORTH CANARA DISTRICT OF THE BOMBAY PRESIDENCY.

BY J. DAVIDSON, T. R. BELL, AND E. H. AITKEN.

PART I.

(*With Plates I, II, III.*)

(*Read before the Bombay Natural History Society on
14th January, 1896.*)

In the Journal of the Bombay Natural History Society, vol. V (1890), pp. 260, 349, two of us published a paper on some of the larvæ and pupæ of the butterflies of the Bombay Presidency, in which we described 94 species which we had ourselves reared. In the next two years, Mr. Bell having in the meantime joined us in our investigations, we had added so largely to this number that we began to meditate a supplementary paper. For various reasons, however, this did not get itself done, as Carlyle would have said, and now the number of butterflies, of which the transformations remain to be discovered, has become so small that it seems invidious to leave them out, and we have decided that our paper should take the form of a list of the butterflies which we have met with in the district, with such information as we can give regarding their habits and transformations. We will not repeat descriptions published in our former paper, but we will supplement or correct these where it appears to be necessary, and in some instances give figures of larvæ which were only described before.

As regards the time of the year at which each species is on the wing, our notes are not so satisfactory as we could have wished. One reason for this is that we are all district officers, spending the monsoon at Karwar and the dry-season on tour through the district, many parts of which are quite different from Karwar in the character of their vegetation and other conditions which influence the butterfly population. So it happens that our observations of particular species are interrupted for months at a time. Collectors in other parts of India often write of the number of broods in the year in terms which imply more regularity than we have observed in this moist and equable climate. We are not inclined to think that the majority of species here have any fixed number of broods in the year. One generation succeeds

another as fast as conditions permit. It would be difficult to name any month in the year when many common species, such as *Euploea core*, Cramer, may not be seen laying their eggs. They are undoubtedly much more plentiful in some months than others, but this is because the largest number of larvæ come to maturity at those times when succulent young leaves are most plentiful and enemies least active. Many species, however, pass through a certain portion of the year, which is unfavourable to them, in a state analogous to hibernation. For example, the smaller *Lycænidæ*, such as *Zizera*, are not to be seen from June to August, when the heavy rain would beat down such feeble butterflies and drown their larvæ. They appear in September and swarm for some months after. The same is true of *Hypolimnias misippus*, Linnæus, perhaps because it feeds on ground weed, and the larva is liable to be drowned by heavy rain. On the other hand, *H. bolina*, Linnæus, and the majority of the *Nymphalincæ* and also the *Papilionincæ* are much more abundant during the monsoon than at any other season. By the end of the year some of them have become very scarce, if they have not disappeared altogether, and it is evident that those which feed on deciduous plants cannot be in the larva state from December to March or later. The *Pierincæ*, excepting *Nepheronia*, are less abundant during the rains than in the cold season, and *Atella phalantha*, Drury, may be called a dry-season butterfly. Its period of inactivity is the monsoon. How each species tides over the particular time which is unfavourable to it is an interesting question on which our knowledge is very limited. We have proved that *Papilio nomius*, Esper, regularly remains in the pupa state from August till the following March or May; but this is a peculiar case. In *P. clytia*, Linnæus = *dissimilis*, Linnæus, the pupa state is often prolonged for weeks or months without regard to season. But in the vast majority of species the pupæ in our cages hatch on the due date as regularly as hens' eggs. Yet there are good reasons for thinking that it is in the pupa state that most butterflies pass through the time when nature is against them. It is also not improbable that eggs laid at an unfavourable time remain unhatched till next season. Lastly, some *Hesperiidæ* hibernate in the larva state. The larva when full grown stops eating and shuts itself up in a cell as if it were about to become a pupa, but it does not actually undergo that change for some weeks or even months. We are not

disposed to believe that in this climate the imago hibernates as it commonly does in Europe.

Apart from hibernation, the length of a larva's life varies a good deal according to the supply of food. When tender leaves are plentiful they grow fast. Butterflies of strong build and powerful flight, such as *Charaxes* and the larger *Hesperiidæ*, live much longer in the larva state than others. The duration of the pupa state, on the other hand, seems to depend on little else than size. Small *Lycænidæ* emerge in a week, the majority of medium-sized butterflies in ten days, and the *Papilios* in a fortnight. *Troides* (*Ornithoptera*) takes three weeks.

We wish we could have made these papers more readable so that others might more fully participate in the enjoyment which we have derived from watching and catching the beautiful creatures represented by the hard names which are to follow ; but the number of species to be described is so large that if we had allowed ourselves to be tempted to digress, the paper would have become too long for publication in any journal.

In conclusion, we must express our grateful acknowledgments to Mr. W. A. Talbot for his valuable help in finding the names of the plants on which our larvæ fed, and to Mr. Lionel de Nicéville for much assistance in the identification of butterflies.

Our illustrations were painted by Mr. Krishnarao Raghunathrao Rane, student at the Bombay School of Art, a young man who took much interest in the creatures themselves.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

1. *Hestia lynceus*, Drury.

From the foot of the ghauts to the crest, and even some distance inland, wherever streams of water flow among high trees, the "wood nymph" may be found, sailing or floating with leisurely elegance, oftenest beyond the reach of the longest butterfly net. When it does come low, nothing is easier to catch. It is rarely, if ever, met with on the coast. It appears from October to June and probably from June to October, but we spend the rains at Karwar, where it does not occur. The larva feeds on *Aganospma cymosa* (order *Apocynaceæ*),

and has been described in this journal by Captain T. Macpherson, Bo. S. C., vol. ii, p. 164 (1887), with a plate showing the egg, larva and pupa under the name of *Hestia malabarica*, Moore. See also a further note on the subject by Mr. de Nicéville on page 242,

2. *Danaïs aglea*, Cramer (*D. grammica* in Marshall and de Nicéville).

Found throughout the district at all seasons, and very common in some places. We have reared larvæ in every month of the monsoon, and indeed throughout the year. The larva and pupa were described in our former paper, p. 262, n. 2.

3. *D. limniace*, Cramer.

We have put our species under this name, but monsoon specimens which we sent to Mr. de Nicéville were pronounced by him to be nearer to *D. septentrionis*, Butler, though much smaller than specimens of that species from the other side of India, and not quite so dark. On the other hand, some of our specimens are larger and paler than others, and those caught in the dry-season, especially above the ghauts, are typical *D. limniace*. The butterfly is fairly common throughout the district, very abundant in some places. The larva and pupa are described by Marshall and de Nicéville. See also our former paper, p. 266, n. 3.

4. *D. chrysippus*, Linnæus.

This ubiquitous butterfly is less common in Canara (at least on the coast) than in most parts of India. There is little left to be said about it, except that we have discovered that it does feed on something else than *Callotropis*, to wit, on *Asclepias curassavica*, a foreign plant of the same order which is now quite naturalised in the district. See our former paper, p. 266, n. 1.

Among the larvæ of this butterfly reared by us last season, two, which were brought to us together and evidently belonged to the same brood, produced fine specimens of the variety, *D. klugii*, Butler, which we have never seen in Canara before or since. We also reared a specimen which distinctly tended towards *D. alcippoides*, Moore.

5. *D. genutia*, Cramer.

Somewhat local on the coast, but common above the ghauts, where it is found at certain spots in swarms that literally block the road. We do not know what draws them together, but this species, as also

D. limniace, Cramer, and *E. core*, Cramer, is much attracted by certain plants when withering, notably by a certain species of *Crotalaria*. The larva and pupa have been described by Marshall and de Nicéville.

6. *Euplaea core*, Cramer.

There is no need to waste space on this species either. It is common everywhere and at all seasons. For one or two days every year, about the beginning of June, hundreds may be seen migrating northwards, together with a few of *D. limniace*, Cramer, and *D. aglea*, Cramer. The natives say that the rains always begin three days after this happens, and we have known one occasion when it was so, which is sufficient for faith. The larva and pupa of this species have been described by Marshall and de Nicéville. They may be found on almost any kind of *Ficus* and on many common apocynaceous plants. The common garden Oleander is often festooned with their silver chrysalids. See our former paper, p. 266, n. 4.

7. *E. coreta*, Godart (*E. coreoides* in Marshall and de Nicéville). Plate I, Figs. 1, 1a.

It is impossible to say how common this species may be, as it cannot be distinguished from *E. core*, Cramer, on the wing. We have taken a good many at Karwar during the monsoon, and last season we were fortunate enough to secure a larva. It was brought by a native boy upon a leaf which appeared to belong to the order *Apocynaceæ*. It was more elongated than the larva of *E. core*, and had only three pairs of filaments, of which the first was very long and turned outwards at the points, the next was nearly as long and almost straight, while the third was short and very thick at the bases. The head was bluish-white, with two darker triangular marks, the body uniform pale bluish-green, the corrugated skin giving the appearance of transverse bands a broad white line separated the darker colour of the underparts. The filaments were pale whitish-blue, edged with darker blue at the points and tinged with orange at the swollen bases. The pupa was like that of *E. core*, the colour being bright silver with the wing-cases and other parts defined in a pale green tint.

8. *E. kollari*, Felder. (*E. sinhala* in Marshall and de Nicéville.)

We have taken this both above and below the ghauts, and consider it commoner than *E. coreta*, Godart, but is almost as difficult to tell on the

wing from *E. core*, Cramer. The caterpillars of these two are almost as like as the butterflies, the only difference being that the tentacles of *E. kollari* are pink and curled at the top, whereas in *E. core* the front pair are never curled. The marginal band is also much whiter in this species. It feeds on several species of *Ficus*. The chrysallis is similarly shaped to that of *E. core*, but of course larger and of a brilliant golden colour, except on the wing-cases, which are silvery-green, if that is an admissible combination. The colour is probably variable, but it is distinguished by three pairs of small dorsal black spots, which are likely to be constant.

Subfamily SATYRINÆ.

9. *Mycalesis mandata*, Moore.

We have described and figured the larva and pupa of this in our former paper, p. 267, n. 5. It feeds on rice and various grasses. The butterfly may be found in damp situations at all seasons. It is most abundant near rice lands at the end of the rains.

10. *M. mineus*, Linnæus.

The only form of this group that we have bred in Canara appears to be that called *M. mineus* by Moore in his great work on the "Lepidoptera Indica" now being published, so we give it that name. It is a very common butterfly at all seasons. The transformations have been described in our former paper on p. 267, n. 6.

The form, or species *M. visala*, Moore, we found common during the dry-season above the ghauts; we have not bred it. With it, in the same locality, we found the form *M. perseus*, Fabricius, which is smaller, and has the rounded apex to the wing in the male, whereas *M. visala*, Moore, has the apex acute.

11. *M. junonia*, Butler. Plate I, Figs. 2, 2a.

More local than the last two and restricted more or less to forest, but common enough both above and below the ghauts. The larva, which feeds on grass, is exceedingly like that of *M. mineus*, Linnæus, and so is the pupa. They are distinguishable to one who knows them, but a description would not enable anybody to tell the one from the other. The pupa is stouter and more compact, and the cremaster (stalk) is more bent and never coloured red.

12. *Lethe europa*, Fabricius.

Not often found at Karwar itself, but commoner in places at the foot of the ghauts. It is a forest butterfly. A single larva, reared on bamboo, was described in our former paper, p. 350, n. 41, but the butterfly that came from it never expanded its wings properly, and we think now that there is reason to doubt the correctness of our identification. It may have been the next species.

After writing the above, we discovered a larva feeding on bamboo which differed in no wise from that of *L. todara*, Moore, but in the head point being a little shorter and quite separate; this larva, which unfortunately was ichneumonized, died; but we are convinced it was that of *L. europa*.

13. *L. todara*, Moore.

This is fairly common wherever there are bamboos, and may be met with at all seasons. It is abundant above the ghauts in the hot weather. The larva, which feeds on bamboo, is somewhat fusiform or spindle-shaped, the surface rough owing to minute and close-set tubercles; head produced occipitally into a long horn composed of two united processes; the anal segment bearing a similar composite process; colour green, with a dorsal and subdorsal white line, and a lateral one also which is marked with crimson at the seventh and eighth segments; head green, with a yellow lateral line; horn pointed red. Pupa stout, slightly constricted between the thorax and the abdomen very like that of *Melanitis*, but rather more angular; green, with wing-cases marked in yellow or gold; suspended rigidly at an angle of 45°. It should be noted that both larva and pupa may be light rosy-brown instead of green, perhaps to match dry grass, for the larva affects concealment, lying close on the underside of a blade, like most of the subfamily.

14. *L. neelgherriensis*, Guérin.

This species, so abundant at Mahableshwar, scarcely comes so far south as Canara. A few have been seen in the north end of the district above the ghauts.

15. *Ypthima philomela*, Johanssen. Plate I, Figs. 3, 3a.

Moore separates this as *Y. baldus*, Fabricius. It is very plentiful everywhere, especially from August or September. Few are seen in the early part of the rains. It flies low and alights on the ground. The larva

feeds on grass and is of the usual satyrine cast, fusiform, with transversely rugose surface and two pointed processes on the last segment, but the usual horns on the head are represented in this species by two small tubercles, each surmounted by a single bristle. The colour is pale pinkish, with darker longitudinal striae, forming to the naked eye a dorsal band or stripe, and a broader darker lateral one with a pale line under it; but the colour is probably variable. The pupa is more slender than that of *Mycalesis* or *Melanitis*, and is distinguished from them also by two prominent dorsal ridges. The colour is mottled brown or greenish.

16. *Y. huebneri*, Kirby.

As common as the last and at the same season, but its first appearance after the monsoon is a little later. It seems absurd in nature to keep up two butterflies so like each other in every way. One would do. The larva of this also feeds on grass and is very like that of *Y. philomela*, Johanssen. The pupa is also very like, but wants the pronounced dorsal ridges.

17. *Zipatlis saitis*, Hewitson. Plate I, Figs. 4, 4a.

We have met with this only at three places on the ascent of the ghauts. It appears late in the evening. We were fortunate enough last September to get the larva on a species of bamboo with large leaves. It is very like that of *M. mineus*, Linnaeus, but the head is not so distinctly marked off from the neck, the horns point forward, and the caudal processes are longer. When young, the larvæ were green with brown heads, but after the last moult the colour became brown, light on the back and darker on the sides, with an ill-defined dusty dividing line, and a dorsal row of dark spots with diverging dusky lines. The pupa is more like that of the genus *Junonia* than the *Satyrinae* generally, having three or four pairs of small tubercles on the abdominal segments, a slight lateral expansion of the wing-cases, and a hump on the thorax; colour vitreous or whitey-brown.

18. *Melanitis ismene*, Cramer.

As common in this district as elsewhere. The monsoon form begins to appear about the end of May and lasts till the end of September. In October we have got both forms (the dry- and the wet-season) promiscuously from what seemed to be one brood of larvæ. Larvæ are plentiful throughout the year, or nearly so, feeding chiefly on rice,

but also on long grasses. The transformations are described in Marshall and de Nicéville. See also our former paper, p. 267, n. 7, *M. leda*, Linnæus.

19. *M. varaha*, Moore.

The discovery by de Nicéville that many of the described species of *Satyrinæ* are merely summer and winter forms of the same has upset the nomenclature so completely that Marshall and de Nicéville's book is now of little use for the naming of that subfamily, and we have followed Mr. Moore's new work in naming our form of this genus *M. varaha*. We see no reason to believe that we have more than one distinct species of this genus, but it is infinitely variable, some winter specimens being scarcely distinguishable from *M. ismene*, Cramer. The larva and pupa too are so like those of *M. ismene* that we have reared the one for the other. The larva of this (*M. varaha*) is, however, smaller and hairless. The butterfly, moreover, is different in its haunts, frequenting jungles rather than rice-fields or gardens. It is pretty common everywhere.

20. *M. gokala*, Moore.

In naming this also we have followed Mr. Moore's guidance. It is not common, being found chiefly in heavy forest. Some dry-season specimens are enormous. We have got the larva on bamboo. It is gregarious throughout its life as a larva, but does not differ much from that of *M. ismene*, Cramer, except in being longitudinally striped with very dark green. Nor does the pupa.

Subfamily ELYMNINÆ.

21. *Elymnias caudata*, Butler.

This is not very common anywhere, but occurs throughout the district in palm gardens and shady places resting on the underside of leaves. It is quite diurnal in its habits, but likes shade. The larva feeds on palms, and has been described and figured in our former paper, p. 268, n. 8.

Subfamily AMATHUSINÆ.

22. *Discophora lepida*, Moore.

This fine butterfly is probably not nearly so scarce as it is supposed to be, but as it frequents dense tiger-haunted bamboo-jungle, and does not fly till after sunset, few specimens are caught. We have got it both above and below the ghauts. It is a butterfly of swift and strong flight,

and alights on leaves or bushes, not on the ground like the *Satyrinæ*. The male has a powerful odour which can be detected as it flies past. The larva feeds on bamboo, like that of *D. tullia*, Cramer.

From two broods reared and a few specimens of this species that we have caught, we find that the colour is much darker in the monsoon than in the dry-season.

The larva is much more like that of a moth than a butterfly, and would have been passed over but for one feature which betrayed it, namely, the last pair of prolegs. They are erect, and not extended beyond the body as they almost always are in the larvæ of moths. Fortunately this little feature excited suspicion, and the larva was taken home and reared. It was cylindrical or slightly fusiform, head large, anal segment furnished with two stout conical processes, widely separated, but scarcely divergent; colour of head greenish-yellow, eyes black, body brown, with a broad pure white dorsal band flanked with conspicuous black marks, and a yellow lateral mark on segments six to eleven; head and body clothed with long reddish or brown hair.

The pupa is shaped not unlike that of *Mycalesis mandata*, Moore, the head-case being produced into two long-conical adjoined processes, the thorax slightly convex and carinated dorsally, the wing-cases evenly expanded, abdomen strongly curved dorsally; surface finely rugose; colour semi-transparent yellowish like a clean white bone, with the dorsal line and the veins of the wings marked in faint flesh colour, loosely attached by the tail.

The larva lives at first on the underside of a leaf, but afterwards it often makes a seat for itself, like the larvæ of *Charaxes*, by joining a couple of leaves together with silk. The larvæ are gregarious in their young days. The eggs are laid in parallel rows along the midrib on the underside of the leaf in very shady places in numbers from three to ten, probably more.

Subfamily ACÆINÆ.

23. *Telchinia violæ*, Fabricius.

Common everywhere, but most abundant on grassy hills from November to March. The larva and pupa were described in our former paper, p. 268, n. 2. We have only reared it on the wild passion-flower (*Modecca palmata*), but it must feed on something else

during the dry-season. This butterfly is certainly "protected," like the *Danainæ*, by an offensive smell and taste.

Subfamily NYMPHALINÆ.

24. *Ergolis tabrobana*, Westwood.

This is one of the commonest butterflies in the district, frequenting forest rather than cultivated places or open plains. In our former paper, p. 269, nn. 10, 11, we described the larva as undistinguishable from that of *E. ariadne*, Linnæus. They both feed on *Tragia involu-crata*, a creeper with stinging leaves, and both butterflies have emerged from one lot of larvæ in our cages which might easily have been taken to belong to a single brood. In form there was no difference, and the colour we thought was too variable to have any significance, ranging from pale green, with or without brown lines, to black, with a broad dorsal stripe of pure white. This year, however, we bred a larger number, and carefully separated the black larvæ from those in which the ground-colour was green, and found that the former produced *E. ariadne*, Linnæus, and the latter *E. taprobana*.

25. *E. ariadne*, Linnæus.

This is not nearly so common in Canara as the last. See remarks above.

26. *Byblia ilithyia*, Drury.

Mr. Blathwayt, the late Collector of Canara, had one specimen of this which was said to have been caught near to Karwar, but we have never met with it in the district. See our former paper, p. 269, n. 12.

27. *Euripus consimilis*, Westwood.

Decidedly a scarce butterfly. All our males have been caught on the tops of high hills, where they come to bask in the sun, from September to October and onwards. The few females we have secured have been met with in low ground at the foot of the hills. We have got them in September, December, and February. In all our specimens of both sexes the ground-colour is pure white.

28. *Cupha placida*, Moore. Plate III, Figs. 3, 3a.

Very common wherever the country is fairly well wooded, and more abundant in the dry-season than during the rains. In habits this butterfly is very like *Atella phalantha*, Drury, flitting restlessly from bush to bush, and keeping its wings in motion even when it alights. The larva, which feeds on the same plant as that species (*Flacourtia*),

is only distinguishable by the colour of the head and by the spines, which are inclined to be semi-transparent in *C. placida* and are black in *A. phalantha*. The pupa can be recognised at once by a double row of slender filaments springing from the principal tubercles, but this is not a point of any structural importance. See our former paper, p. 270, n. 14.

29. *Atella phalantha*, Drury.

This species is scarcely to be met with during the monsoon, but is common everywhere in the cold season, preferring open country. We have described the larva and pupa in our former paper, p. 269, n. 13. It is difficult to account for the descriptions of the larva by Horsfield and Moore which are quoted in de Nicéville's book. They differ from each other and from all the larvæ that we have reared.

30. *A. alcippe*, Cramer.

This is a very local species. We have met with it only at three places on the ascent of the ghauts, from January to April. In April last year we found the larva on a tree, which we believe to be a very local species of *Hydnocarpus*, but this requires verification. It is like that of *Cirrhochroa*, cylindrical, with six rows of fine branched spines, head unarmed, colour green, with longitudinal interrupted lines of brown or claret colour on the back only : head pale yellowish with two black bars. In habits it also resembles the restless and active larva of *Cirrhochroa*. The pupa is almost a smaller copy of that of *A. phalantha*, Drury.

The larvæ and pupæ of this and the last two species, as well as the aspect and habits of the butterflies, argue a much closer affinity with the genus *Cirrhochroa* than the arrangement adopted by de Nicéville would suggest.

31. *Cethosia mahratta*, Moore.

This is fairly common everywhere in wooded country, especially during the latter half of the rains. The larva, which is gregarious, feeds on *Modecca palmata*, or any passion-flower. We have described and figured it and the pupa in our former paper, p. 270, n. 15.

32. *Cynthia saloma*, Swinhoe.

Pretty common everywhere in forest from August or September onwards. Males congregate on the peaks of hills to bask in the sun. Monsoon specimens are conspicuously darker than those found in the dry-season. The larva and pupa have been described and figured

in our former paper, p. 270, n. 16. The female of this butterfly is often difficult to tell from *Parthenos virens*, Moore, on the wing, its flight being similar, though less powerful.

33. *Apatura camiba*, Moore.

Judging by the number of larvæ that we get from September to the end of the year, this butterfly must be much commoner than it seems. The males bask on the tops of high trees, and the females escape observation by their resemblance to *Ergolis*. In connection with this similarity it is curious, if nothing more, to note that the larva has the head armed, like that of *Ergolis*, with two long, spiny horns, and that they both have the peculiar habit of waving their heads from side to side incessantly as they walk. We have described the larva and pupa in our former paper, p. 271, n. 17. This is one of the few *Nymphalince* of which the larvæ rest always on the underside of a leaf.

34. *Precis iphita*, Cramer.

This is disgustingly common and constantly gets itself mistaken for more valuable species. The larva feeds on "karvi" (*Strobilanthes callosus*), and is like that of any species of the next genus. It is generally of a uniform dusky blackish colour. See our former paper, p. 271, n. 18.

Genus JUNONIA.

To save time we may say here that we have reared all our *Junonias*, and cannot ordinarily tell the larva or pupa of one from another. They differ a little in colour, but that is variable in each species. They all feed on acanthads. The larva of *J. lemonias*, Linnæus, has two minute spines on the head, which are wanting or less developed in the others.

35. *J. asterie*, Linnæus, or *almana*, Linnæus.

Common everywhere, frequenting damp grounds and ditches. The *almana* form appears in October and gives place to the *asterie* form in June. See our former paper, p. 272, nn. 19, 20.

36. *J. lemonias*, Linnæus.

Equally common, but frequenting drier country than the last, and also found in thick forest, where the larva feeds on *Strobilanthes*. See our former paper, p. 272, n. 2.

37. *J. hierta*, Fabricius.

Pretty common in open country, but absent during the monsoon. See our former paper, p. 272, n. 22.

38. *J. orithyia*, Linnæus.

This species likes stony plains and bare hills, and is consequently comparatively rare in Canara, and altogether wanting during the monsoon. It rests always on the ground. See our former paper, p. 272, n. 23.

39. *J. atlites*, Linnæus.

This is not so widely distributed as the last four species, but is fairly common on the Canara coast about rice-fields, chiefly at the end of the rains. It occurs also above the ghauts. The larva is coloured more distinctively than the others, being dull smoky black, with a well-defined orange-brown stripe above the legs. The pupa is of a uniform slaty colour.

40. *Neptis hordonia*, Stoll. Plate II, Figs. 1, 1a and 1b.

This is very common in all the more open wooded or scrubby parts of the district during the latter half of the rainy season and throughout the dry months. During June and July it is rarely seen. The larva may be found on several species of *Acacia* and *Albizzia*, and has the curious habit of feeding by preference, not on green leaves, but on those which it has caused to wither. The trees on which it feeds have all bi-pinnate leaves with minute leaflets. It bites through one or two pinnae, which immediately droop and dry up, but are kept from falling by a few threads of silk with which the larva has taken the precaution to attach them to the central leaf-stalk. Thenceforth it lives among them and feeds entirely on them. The larva has two forms. In the first (fig. 1b) the head is large and roughly triangular. The segments of the body increase to the fourth and then diminish gradually, and the third, fourth, sixth and twelfth have each two obtuse dorsal points. The forepart, from the fourth segment, is generally inclined downwards at an angle with the rest of the body, and is, with the underparts, of a dark greenish-brown colour. The rest is just that shade of greenish-grey which the leaves assume when withered, and is crossed by diagonal dark bands exactly representing the spaces between the leaflets as a painter would paint them—a most perfect disguise. The second form (fig. 1a) of the larva differs in having the head furcate,

while the dorsal points are replaced by long spine-like processes. The figure will give a better idea of the difference than any description.

After writing the above, we have discovered that the two forms of larvæ produce imagines differing in the colour of the "male-mark"; the butterfly resulting from the larvæ with spines and the bi-pointed head has a light male-mark; that resulting from the other a dark male-mark. Another fact which points to the two larvæ producing different species is that the two forms of larva are never found together, for the smooth type of caterpillar is often found in quantities on one bush; the larvæ also very slightly in their habits; and, whereas the smooth caterpillar feeds on *Albizzia* and *Acacia*, the spined one has never been found on any plant but *Acacia*. The butterfly with the light male-mark is typical *N. hordonia*, we are informed by Captain E. Y. Watson. See our former paper, p. 272, n. 24.

41. *N. viraja*, Moore. Plate II, Figs. 2, 2a.

This is not nearly so common as the last, but appears to be generally distributed. The larva feeds on the blackwood tree (*Dalbergia latifolia*), and also on *Dalbergia racemosa*, and has similar habits to those of *N. hordonia*, Stoll, which it resembles in form, but the head is bifid at the top, and the dorsal points are wanting, while the last segment is produced into a single blunt point. The colour is dark greenish-brown, the forepart, as in *N. hordonia*, being much darker than the rest, but bordered with pale grey. The pupa is like that of *N. hordonia*, but rather broader, and the wings more evenly expanded. See our former paper, p. 351, n. 43.

42. *N. leucothoë*, Cramer (*N. varmona* in de Nicéville).

This is by far the commonest and most widely spread of the genus. It may be found in any month of the year and anywhere, frequenting gardens and cultivated land more than the others. The larva, which feeds on various peas, is very like that of *N. jumbah*, Moore, but is more rugose. It has not the curious habits of the last two. The pupa also resembles that of *N. jumbah*.

43. *N. ophiana*, Moore.

This is the rarest of our *Neptes*. We once found eggs, which produced larvæ very like those of *N. jumbah*, Moore, but they died.

44. *N. kallaura*, Moore.

We found a pupa once of this species hanging to a leaf of *Dalbergia confertifolia*; the larva had been feeding on the creeper. We did not recognise the species, mistaking it for the preceding, until some months after it was bred. This bred specimen is almost the only one we have: it was obtained in February in the Supa taluka. Pupa exactly like that of *N. jumbah*, Moore.

45. *N. jumbah*, Moore.

Common enough everywhere. The larva is almost omnivorous. It has been described by de Nicéville and in our former paper, p. 273, n. 25.

46. *Cirrhochroa thais*, Fabricius.

We believe in only one species of *Cirrhochroa* in this district, an infinitely variable butterfly as to size, colour and markings. It is very common in forest everywhere and at all seasons, restlessly flitting about from tree to tree, like species of *Cupha* and *Atella*, and alighting frequently with wings half open or in motion. In our former paper (p. 273, n. 26) we described the larva, which is as restless as its parent, but perhaps with more reason, for hundreds are destroyed by small ichneumons, and also by a large brown fly which comes to maturity within the pupa.

47. *Hypolimnias bolina*, Linnaeus.

This is a common enough butterfly in all the moister regions of this presidency, but nowhere have we found it in such abundance as in Canara. It also appears to vary more here than elsewhere, and the varieties do not depend much upon season. It is true that at the beginning of the monsoon all the males are very small, not larger than *H. misippus*, Linnaeus, with the spots on the upperside more white than blue, and with a distinct broad white fascia on the underside; but two months later these may be found side by side with the most splendid specimens of the form described as *H. avia* by Fabricius, and every grade between. During the dry-season this butterfly is not often met with. We have described the larva and pupa in our former paper, p. 273, n. 27. The favourite food-plant appears to be a nettle-like weed which we identify as *Fleurya interrupta*.

48. *H. misippus*, Linnaeus.

This species affects more open country than the last, and is, perhaps for that reason, not nearly so common in Canara. During the rainy season we have never seen it, but it begins to appear in September or October, and continues till about the end of the year. We have twice met with the form of female which wants the black on the apex of the forewing bearing an oblique white band, and has been supposed to mimic *Danaïs klugii*, Butler. The larva differs little from the last. We have never reared it in Canara. In other districts we have found it on *Portulacca oleracea*. See our former paper, p. 274, n. 28.

49. *Parthenos virens*, Moore.

This is not by any means a rare butterfly in forest country, especially towards the end of the rainy season. Its grand spread of wing and bold flight always arrest attention. The manner of its flight is the same as that of *Limenitis*, *Athyma*, and some other genera, a jerky stroke at short intervals between which the wings are held stiffly outstretched and pointing a little downwards, but those genera lack the power of *Parthenos*. Sometimes a solitary one is met with travelling across open plains, but we do not know that it migrates. We described and figured the larva and pupa in our former paper (p. 274, n. 29). It feeds on a creeper belonging, we believe, to the *Cucurbitaceæ*.

50. *Limenitis procris*, Cramer. Plate II, Figs. 3, 3a.

This beautiful species is pretty common during the rains and even in the dry-season in open forest. It flies like the last, and rests, like it, with wings open on the upperside of a leaf. We do not mean that it sleeps in this position: probably it does not. We described the larva in our last paper (p. 274, n. 30) as feeding on *Mussoenda frondosa*. We have since found it oftener on *Wendlandia exserta*, another plant of the same order.

51. *Athyma perius*, Linnaeus.

This species, which is plentiful further north, is the least common of the genus on the Canara coast. It appears, like them all, during the latter part of the rainy season and probably for some time after, if it does not last till May. It is more like a *Neptis* in its ways than the three which follow. It feeds commonly on *Glochidion lanceolatum*

and *G. velutinum*. We have described the transformations in our former paper (p. 275, n. 31).

52. *A. mahesa*, Moore. Plate II, Figs. 4, 4a.

This is perhaps the commonest of the genus with us. We described the larva and pupa in our former paper (p. 350, n. 42) and figure them now. Larvæ are found from August, feeding on *Olea dioica* and *Linociera malabarica*, and the butterfly becomes common in September and continues through the dry-season.

53. *A. inara*, Doubleday and Hewitson (*A. inarina* of de Nicéville.)

Males are common on the hill tops from August onwards. We get few females. The larva, which feeds on *Glochidion velutinum* and *G. zeylanicum*, is very like that of *A. mahesa*, Moore, cylindrical, with six rows of fine branched spines, the dorsal being longer than the lateral, and those on the third and fourth segments longer than the rest, the second segment unarmed, the bases of the legs set with short simple spines; colour pure green, with a large brown patch on the ninth segment, spines brown, and head dark brown; head covered with short simple brown spines and white tubercles. The pupa is also like that of *A. mahesa*, but of the curious processes on the back the posterior one is much longer and more inclined forwards.

54. *A. selenophora*, Kollar.

This appears at the same season as the last, but is comparatively scarce, and the female must be considered a valuable butterfly. Males bask on the tops of the hills and put themselves in the way of being caught, but the females haunt the forest-clad sides and are seldom seen. This is true of all the *Athymas*, except *A. perius*, Linnæus, and of many other butterflies. The larva is very like that of *A. inara*, Doubleday and Hewitson, but the dorsal patch is much smaller, and there are some white spots on the sides. The pupa is distinguished from that of *A. inara* by slight differences in the shape of the grotesque processes on the head and thorax. The common food-plant is *Adina cordifolia* (*Rubiaceæ*).

55. *Symphædra nais*, Forster.

This is almost unknown on the coast, but common enough above the ghauts. The larva, which feeds on *Diospyros melanoxylon* (the "Ebony tree," *Ebenaceæ*), has been fully described by de Nicéville.

56. *Euthalia laudabilis*, Swinhoe.

This is, generally speaking, the least common species of the genus with us, but some years it has been in great force at Karwar during the rains, and the number of larvæ brought in by native boys is surprising. The larvæ and pupæ of our *Euthalias* are almost alike in form, and the transformations of *E. garuda*, Moore, have so often been described and figured that it is unnecessary to waste space on the subject here. The collector may distinguish the different species at a glance by the colour, and they feed on different plants. The larva of *E. laudabilis* feeds on *Diospyros candolleana* (*Ebenaceæ*), and is green, with a vinaceous dorsal patch on each segment, enclosing a whitish dark-centred ocellus. These patches vary in size, those on the fourth, seventh and tenth segments being usually the largest, and those on the fifth and sixth small or obsolete. The pupa is green, with silver spots and a bright line of the same colour along the sides of the dorsal triangle. *E. laudabilis* is a forest butterfly. Specimens caught or bred in the monsoon are conspicuously smaller and richer in colour than those found in the dry-season. (See our former paper, p. 277, n. 35, under *E. evelina*, Stoll, that name being restricted to the Ceylonese form.)

57. *E. lepidea*, Butler.

This species is very common throughout the district, frequenting the undergrowth of shady forests and seldom coming into the sunlight. Its flight is not strong, and it rests much on leaves with wings open. The larva, which feeds on *Melastoma malabathricum* and *Careya arborea*, may be distinguished from the last by the dorsal ocelli, which are red with blue centres. The pupa has all the prominent points golden-yellow tipped with black. See our former paper, p. 276, n. 34.

58. *E. garuda*, Moore.

This is as common here as in other parts of the presidency, frequenting gardens and basking on walls. It is a thirsty insect, easily attracted by fermented *toddy*. The larva has a bright yellow dorsal line edged with blue in place of the ocelli which distinguish the last two species. It feeds on the mango, cashewnut, mulberry, and other things. The pupa has the points and ridges edged with yellow. See our former paper, p. 275, n. 32.

59. *E. lubentina*, Cramer.

This exquisitely beautiful butterfly is also very common, but different in its habits from the other two and therefore not so often noticed. The males are fond of basking in the sun on high trees or hill tops along with *Charaxes*, *Athyma* and *Cynthia*. With the exception of *E. garuda*, Moore, occasionally, the other *Euthalias* never do this. The females frequent the forests at the foot or on the slopes of the hills and do not show themselves much. The larva of this species, which feeds on *Loranthus*, commonly called "mistletoe," has the dorsal area of most of the segments brown or claret-coloured, with or without a pure white diamond in the middle. The pupa is distinguished by a small brown patch on each side. See our former paper, p. 276, n. 33.

60. *Pyrameis cardui*, Linnæus.

The "Painted Lady" is found sparingly throughout the district. At times it appears in great numbers, continues for a week or two and disappears again. As is well known, it is a migratory butterfly, and is known in almost every part of the world. It has a rapid, irregular flight, and is fond of settling on the ground and on rocks. The curious habits of the larva are described at length by de Nicéville. We have found larvæ in Canara in November, feeding on *Zornia diphylla*, and on a thistle-like plant of the genus *Blumea*, which is its common food in other parts of the presidency also. See our former paper, p. 277, n. 36.

61. *Cyrestis thyodamas*, Boisduval. Plate III, Figs. 1, 1a.

The "Map Butterfly" is pretty common throughout the district in suitable situations. A suitable situation is a clear stream of running water, among rocks, with trees growing over it, on which the butterfly may rest, pressed flat against the underside of a leaf. Curiously enough it lays its eggs on the banian (*Ficus indica*), which is not a tree at all peculiar to such situations. We described the larva and pupa in our former paper, p. 351, n. 44. They are quite unlike those of any other butterfly we know, so we give a figure of them both.

62. *Kallima horsfieldii*, Kollar. Plate II, Figs. 5, 5a.

We have only one species of *Kallima*, which may be called *K. wardi*, Moore, by those who believe in the distinctness of that form. It is a very variable butterfly and the wet- and dry-season

forms are as different as *Junonia asterie*, Linnæus, and *J. almana*, Linnæus. The former is small, dark, green-tinted above and faintly ocellated on the underside, with the apex of the forewing scarcely produced at all. The latter is large, pale on the upperside, very variable on the underside, but without a trace of ocellation, and has the apex produced into a point which is sometimes quite a quarter of an inch in length. Hyaline marks may be present in either form. The butterfly is very common, especially during July and August, among "karvi" (*Strobilanthes*), on which its larva feeds, but is more difficult to catch than most owing to the swiftness of its flight and its habits of always resting on the trunk of a tree (head downwards) in situations in which a net is not easily manœuvred. No butterfly, however, is more easily seduced with liquor. It flies in the day, but keeps out of the sun. We described the larva and pupa in our former paper, p. 277, n. 37, and figure them now.

63. *Doleschallia polibete*, Cramer. Plate III, Figs. 2, 2a.

From August onwards the males of this species may be found basking on the hill tops, but we very rarely see a female, and all our specimens of that sex were bred. We have found eggs and larva in September and October on a species of *Eranthemum*, which belongs to the same natural order, be it noticed, as the food-plants of all the *Junonias* and *Kallima*. The eggs are laid in batches, and the larvæ are gregarious. Both larva and pupa are described by de Nicéville. We figure them however.

64. *Charaxes schreiberi*, Godart.

This splendid species is certainly one of our rarest and most beautiful butterflies. The males have the habit, common to all the genus, of basking during the hottest hours of the day on chosen trees about certain rocky peaks, and as one of these basking points lies within a few miles of Karwar, we have secured a certain number of specimens, mostly much broken. But females cannot be got in this way. The larva feeds on "wagati" (*Wagatea spicata*), but this plant is much commoner than *C. schreiberi*, and is, moreover, so villainously thorny that the chance of finding larvæ is not proportionate to the travail of looking for them. What might we not have achieved if the hours spent in perusing the leaves of wagati had been devoted to some useful work! As if this were not enough, the creature has an

alternative food, *Rourea santaloides*, also too common by half. Up to this date we have only reared two specimens, which were fortunately both females. The larva is very like that of *C. imna*, Butler, but the white semicircle on the back of the latter is replaced by a yellowish crescent. The pupa is just like that of *C. imna*.

The flight of this butterfly is very powerful, as might be inferred from the robustness of the thorax. We have observed before that robust butterflies grow slowly, and this is borne out by the present species. A larva, which emerged from the egg on October 25th, did not become a pupa till January 26th, and no part of this time was passed in hibernation.

65. *C. athamas*, Drury.

This is found everywhere and at all seasons. We have described the transformations in our former paper, p. 227, n. 38. The food-plants are many, *Poinciana*, *Cæsalpinia*, *Grewia*, &c.

66. *C. fabius*, Fabricius.

Though more generally distributed, this is not nearly so common as the last. The larva, which feeds on the tamarind tree, was described and figured with the pupa in our former paper, p. 278, n. 39.

67. *C. imna*, Butler.

From the number of males that collect on popular basking places this cannot be uncommon, but females are rarely seen. The larva and pupa were described and figured in our former paper, p. 278, n. 40. We have reared them from June to November on "*Wom*" (*Saccolipetalum tomentosum*) and on *Aglaiia roxburghiana*.

Family LEMONIIDÆ.

Subfamily LIBYTHÆINÆ.

68. *Libythea myrrha*, Godart, or *rama*, Moore.

This is perhaps the rarest of all our butterflies. In six years we have got two specimens, both on the top of a high hill near Karwar.

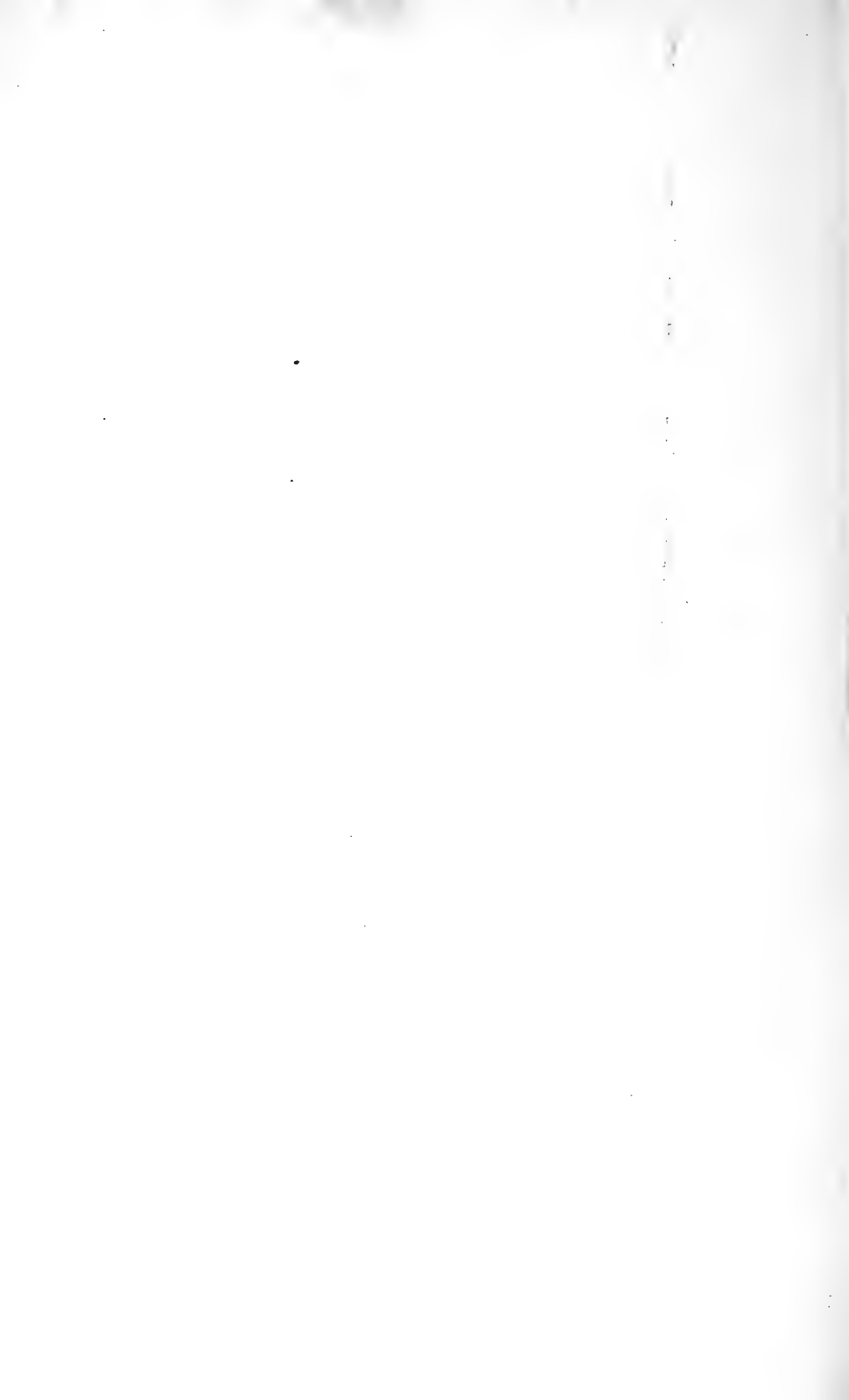
Subfamily NEMEOBIINÆ.

69. *Abisara fraterna*, Moore.

This is very common at all seasons, perching on leaves with its wings partly open, and facing about every now and then in a way peculiar to itself. They fly much at dusk, very swiftly, chasing each other in the air. The larva and pupa were described in our former paper, p. 352, n. 45.









EXPLANATION OF THE PLATES.

PLATE I.

- Figs. 1, 1a... Larva and pupa of *Euplœa coreta*, Godart, p. 241.
 „ 2, 2a... „ „ „ *Mycalesis junonia*, Butler, p. 242.
 „ 3, 3a... „ „ „ *Ypthima philomela*, Johanssen, p. 243.
 „ 4, 4a... „ „ „ *Zipætis saitis*, Hewitson, p. 244.

PLATE II.

- Figs. 1, 1a... Larva and pupa of *Neptis hordonia*, Stoll, p. 250.
 „ 1b ... Larva of ditto, second form, p. 250.
 „ 2, 2a... Larva and pupa of *Neptis viraja*, Moore, p. 251.
 „ 3, 3a... „ „ „ *Limenitis procris*, Cramer, p. 253.
 „ 4, 4a... „ „ „ *Athyma mahesa*, Moore, p. 254.
 „ 5, 5a... „ „ „ *Kallima horsfieldii*, Kollar, p. 256.

PLATE III.

- Figs. 1, 1a... Larva and pupa of *Cyrestis thyodamas*, Boisduval, p. 256.
 „ 2, 2a... „ „ „ *Doleschallia polibete*, Cramer, p. 257.
 „ 3, 3a... „ „ „ *Cupha placida*, Moore, p. 247.

(To be continued.)

THE POISONOUS PLANTS OF BOMBAY.

BY SURGEON-MAJOR K. R. KIRTIKAR, I.M.S., F.L.S.,

CIVIL SURGEON, THANA.

PART XIV.

(With plate P.)

(Continued from Vol. X, page 107.)

ALANGIUM LAMARCKII—(*Thwaites*).

Natural Order—CORNACEÆ.

MARATHI—अंकलि (Ankol).

This is a very handsome tree, and grows very well in the Konkan. Whether in foliage, flower, or fruit,—in whatever condition or season it is seen,—it is a striking plant. It is beautifully green-leaved throughout the year, except when about to blossom. Every branch of it, from the largest to the smallest, is covered from head to foot with clusters of cream-white, sweet-scented flowers. The entire plant thus in full bloom is very attractive to the eye. Later on, when in the height of summer the branches are loaded with clusters of fruit of the size of an ordinary marble, their rich bright crimson is particularly charming to the eye.

TRUNK.—The trunk of the tree is short, erect, generally from 2 to 3 feet in girth. Rheede gives its girth as 6 feet (*Hort. Mal.*, vol. iv, p. 55). Sometimes the trunk is irregular. There is a large tree in the compound of the Military Hospital, Thana, the girth of which is fully nine feet. The main trunk sends out underground stems or “*suckers*.” The tree in the Military Hospital compound referred to has nearly half a dozen distinct trees developed from such suckers within an area of twenty feet around. In a Mahomedan grave-yard not far from the Civil Hospital, Thana, there are several large trees from which several smaller trees have developed through suckers. Writing about Central India plants, Brandis observes that the trunk “coppices well” (*Forest Flora*, p. 250). So it does in the Konkan.

The height of the tree varies from 30 to 40 feet; under favourable circumstances it is sometimes as much as 50 feet.



Isaac Benjamin del

Mintern Bros. Chromo lith. London.

THE POISONOUS PLANTS OF BOMBAY.

Alangium Lamarckii Nat. Ord. Cornaceæ.

A. The plant in fruit & new foliage. B. The plant in flower without foliage. C. Transverse section of fruit.



BRANCHES.—The branches and branchlets are said to be often spinescent. The Thana plants appear to be singularly free from spines of any sort. The branches are very irregular.

BARK.—The thickness of the bark as given by Brandis is only half an inch. I think I can safely say that the bark is not unfrequently about an inch in thickness. In young branches it is less than a quarter of an inch. When Brandis says that the bark is “grey with some white specks,” it is to be understood that he refers to the bark of young and tender branchlets. The bark of the new off-shoots is light green. Whether in the young or old branches and branchlets, the bark is marked with irregular undulations. It is also deeply marked with the scars of the fallen leaves and pedicels of the former season.

WOOD.—The wood is described by Brandis as “light brown or yellowish-brown.” “It is tough and strong, weighing 49 lbs. per cubic foot.” Brandis very happily describes it further as “fine, even, close, and smooth grained.” Kurz says that the wood is “dark-brown.”* This answers the description of the wood examined in the Thana plants. “The wood is beautiful” says Roxburgh—(*Flora Indica*, p. 404—Calcutta, 1874).

LEAVES.—Exstipulate, petiolate, alternate; membranous, says Brandis; 3-6 inches long, 1-2 inches broad; entire. Both Hooker and Brandis say they are persistent, but of this more hereafter under the head of “Remarks.” The shape of the leaves is very variable even on one and the same branch—from linear oblong to elliptic, obtuse, acute, or long-acuminate; pubescent or tomentose when young; glabrous or pubescent below when full grown; the base unequal, often somewhat equal. The chief character of most leaves is that they are three-nerved at the base. The nerves are pubescent and distinctly white and prominent on the under surface. The main lateral nerves vary from five to eight on either side of the midrib, joined by prominent transverse and intra-marginal veins. Brandis observes that in the axils of primary nerves there are often “tufts of hairs or hollow glands.” This is a fit subject for microscopical workers who may be interested in the study of the morphology of the leaf of this plant. It may be observed here that in the axils of the leaves of one season

* Kurz—*Forest Flora of British Burma*, Vol. I, p. 543, 1877, Calcutta.

there are buds of the blossom and foliage of the next season. These buds are also well worthy of a more extended microscopical study.

PETIOLE.—Brandis very accurately describes it as " $\frac{1}{4}$ inch, hairy, often villous or woolly;" not unoften it is slightly twisted on its axis.

FLOWERS.—White; fragrant; hermaphrodite; silky white. jointed on the pedicel; in axillary, close small fascicles or condensed cymes. The flowers are seldom, hardly ever, more than three at a time in each axil. PEDICELS pointed, very short; $\frac{1}{8}$ inch.

BRACTS.—Clarke says (in Hooker's Flora of British India, vol. ii, pp. 741, 742) that the bracts are entirely absent. Brandis, on the other hand, says that "the pedicels are bracteate" (*op. cit.*). Brandis further remarks that the peduncles and pedicels are usually woolly.

ÆSTIVATION.—"Twisted" say Wight and Arnott (*Prodromus*, p. 325); valvate says Clarke. This is notably so in the corolla.

CALYX.—Tubular; calyx tube woolly; minutely 5—10 toothed; "turbinate" says Brandis. Adnate to ovary; green; accrescent. The green colour of the calyx remains to the last, even in mature fruit.

COROLLA.—Very showy; greenish when unexpanded on the dorsal surface. Varying in colour when fully expanded from pale-white to cream-white, with an occasional dash of light crimson or pink.

PETALS.—Strap-shaped or linear oblong; reflexed; deciduous; varying in number from 5 or 6 to 10; this has given rise to the species described as *A. hexapetalum* and *A. decapetalum*. Wight and Arnott observe that the number of petals corresponds to the number of the segments of the calyx. "Blunt, tawny-velvety," says Kurz.

ANDRŒCIUM :—

STAMENS.—Deciduous; exerted; varying in length from $\frac{1}{2}$ to $1\frac{1}{8}$ inch, woolly without (Brandis). Twice as many as the petals; thrice says Hooker, and four times as much say Wight and Arnott, as also Kurz (*op. cit.*).

FILAMENTS.—Distinct but short; "with long stiff hairs at base" (Brandis); "densely hirsute" says Kurz.

ANTHERS.—Very long; basifixed (Brandis); Wight and Arnott say "they are introrse, 2-celled, often sterile" (*Prodromus*, p. 325).

GYNÆCIUM :—

OVARY.—Inferior, globose, 1-celled, adherent to the calyx-tube firmly, surmounted by a disk. Wight and Arnott say that “the ovary is 1—2 celled.” But this is not accurate. For, observe the following remark, quoted from Lindley, in Wight’s *Illustrations of Indian Botany* (vol. i, p. 211, Madras, 1840), with reference to the “*Affinities*” of the Natural Order *Combretaceæ* :—“The solitary carpel of which the fruit consists is peculiar to these”—meaning the *Combretaceæ* (K.R.K.)—“and to the *Alangieæ*, and neatly distinguishes these two “orders from all others of the myrtal alliance.”

OVULE.—Solitary, pendulous (Wight and Arnott).

STYLE.—One ; very long or “elongate” as Brandis terms it. Glabrous; uniformly cylindric; subulate,—that is to say, expanded at the base into a thick coloured disk which is fleshy and covers the top of the ovary.

STIGMA.—Large, capitate or subglobose. Wight and Arnott simply say it is “*dilated*,” but this does not convey an accurate idea. I think the stigma may be termed “many-headed,” as will be amply seen from the flowering branch in my illustration.

FRUIT.—Some call it a berry ; others call it a drupe, varying from $\frac{1}{2}$ to 1 inch in vertical diameter ; ellipsoid ; tomentose says Brandis ; crowned by the somewhat enlarged calyx-limb ; quite smooth, with slight vertical ribs when dry (Thwaites). Clarke says it is closely pubescent or finally glabrous. The colour of the fruit is black says Clarke ; but, as will be observed from my illustration, it is rich crimson in its entire “epicarp.” The “epicarp” is tough. The “mesocarp” or “sarcocarp” is pulpy and mucilaginous. The “endocarp” is bony, and separated from the sarcocarp like a putamen (Wight and Arnott).

SEED.—Oblong, solitary, pendulous.

ALBUMEN.—Ruminated ; “fleshy” say Wight and Arnott.

EMBRYO.—Straight, inverse (Roxburgh).

RADICLE.—Superior, elongated.

COTYLEDONS.—Leafy ; crumpled ; note that Wight and Arnott say that they are “flat,” and not crumpled. Note also that it is the

crumpled nature of the cotyledons of *Alangium* which distinguishes it from its congener, *Marlea*, which latter has a flat cotyledon.

REMARKS.

The following are the synonyms given in the Index Kewensis* :—

1. *Alangium acuminatum*, Wight = *Lamarckii*.
2. *Alangium decapetalum*, Lam. Encyc. I, 174 = *Lamarckii*.
3. *Alangium glandulosum*, Thw. Enum. Pl. Zeyl., 133 = *Lamarckii*.
4. *Alangium hexapetalum*, Lam. Encyc. I, 174 = *Lamarckii*.
5. *Alangium latifolium*, Miq. ex C. B. Clarke in Hook. f. Flora Br. Ind. II, 741 = *Lamarckii*.
6. *Alangium octopetalum*, Blanco, Fl. Filip. Ed. II, 310 = *Lamarckii*.
7. *Alangium sundanum*, Mig. Fl. Ind. Bot. I, 1, 774 = *Lamarckii*.
8. *Alangium tomentosum*, Lam. Encyc. I, 174 = *Lamarckii*.

This will be considered a formidable array of synonyms. But such of my readers as have hitherto followed my previous description and will note carefully the observations embodied hereafter under this head will be able to understand that, barring all seasonal and climatic changes, which are liable to vary at all times, from year to year, the principal characters of the species above depicted under their respective synonyms have been more or less alluded to in the foregoing description of the plant under notice. The terms *hexapetalum*, *octopetalum*, *decapetalum* are indicative of the number of petals. The term *acuminatum* refers to the apex of the leaf. The term *tomentosum* refers to the existence of a more or less villous condition of the leaf and flower. The term *latifolium* refers to the breadth of the leaf. The term *glandulosum* refers to the existence of glandular bodies, developing under special circumstances in particular localities under the influence of climate. The term *sundanum* refers to the special peculiarities of the plant as it is seen growing in the Straits of Sunda.

In describing the bark of the trees as examined by Brandis in North and Central India, he says it is "grey with some white specks." It must be understood that this description is of the bark of young

* Part I, page 70, Oxford, 1893. Edited by B. Daydon Jackson under the direction of Sir Joseph D. Hooker, as the noble gift of a noble man—Charles Robert Darwin—to the earnest student of Universal Botany (K.R.K.)

branches; for, as the bark gets old, it assumes a brownish tinge. The oldest bark is distinctly brown-black. Some Botanists describe the bark as smooth. Brandis describes it more accurately when he says it has irregular undulations. Brandis says that the wood of *Alangium Lamarekii* is well suited for ornamental work. It is easily worked, and when properly polished, it displays "a beautiful glossy surface." It may be noted here that the petals and stamens are distinctly deciduous. This fact is not specially mentioned by previous observers, except by Wight in the letter-press accompanying his plate No. $\frac{194}{1005}$.^{*} This deciduous nature of the petals and stamens is well illustrated in Wight's fig. 2 in the plate just referred to. It is also shown in my illustration (plate P) accompanying this description, where, on the part of an old flowering sprig marked *B*, there are two unopened buds, and below them are the persistent green accrescent calyx and the white style capped with a multilobate stigma of the third flower, from which the petals and stamens have fallen in due course. *Apropos* of this compare the following description of Baillon:—"Style girt at base with epigynous cupular or pulvinate disk, at stigmatose apex "clavate or capitate, oftener minutely 4— ∞ —lobate" (The Natural History of Plants, vol. VI, p. 286). Observe, as against this description of the stigma, the remark of Dr. Trimen that the stigma is large and only 4-lobed. (Hand Book of the Flora of Ceylon: Part II, 1894, pp. 285-286.)

The remarks which Wight and Arnott make at the conclusion of the description of the *Natural Order*, which they term *Alangieæ*, are specially worthy of the consideration of those who would engage themselves in the minute study of the very interesting flower of the plant I am describing. "The portion of the torus," say Wight and Arnott, "between the calyx and ovary, to which the stamens and petals are attached, is of a different colour and texture from the above-mentioned epigynous disk which induces us to refer the latter to the style, not to the torus."[†]

I may add one word more with regard to the entire blossom-process in *Alangium Lamarekii*. The following is the order every year. The entire foliage of the previous year falls in the hot weather. Then

^{*} *Icones Plantarum Indiæ Orientalis*, vol. I, 1840, Madras.

[†] Wight and Arnott's *Prodromus*, p. 325.

comes the beautiful sweet smelling blossom covering the tree, denuded of its leaves, from head to foot. As the fruit next forms, first green, then gradually turning beautiful crimson, capped with the uppermost portions of the toothed calyx, new foliage appears of bright light green colour before the monsoon sets in. The plant is at this time very charming to the eye. When the fruit matures, the village-boys gather round the tree in search of the sweet pulp covering the seed. It is to them—poor half-starved creatures—an out-of-door repast of much relish judging from the avidity with which they gather the fruit as fallen under the tree, or picked by an insidious ascent on the snarled branches of the coveted plant. Note that Baillon observes that “the branches of inflorescence are elongate or sometimes more or less contracted; pedicels generally contracted.”*

With regard to the observations of Loudon, who describes the plant as *Alangium decapetalum*, I have this to say: Loudon says† that the plant has ten petals; the branches are spiny. His figure, however, is only a solitary flower. This is as incomplete as it is misleading. Baillon distinctly says that *Alangium* of Lamarck is *unarmed, sometimes spinescent*. The former, but not the latter, is my experience in the Thana plants. Loudon observes that the plant grows in light sandy soil. Be it so. I can add that in the *moorum* soil of Thana the plant grows very well indeed. Perhaps it may be said that in *moorum* soil, or any similar soil, the plant thrives superbly. “Cuttings,” says Loudon, “root in sand under a hand glass in moist heat.” This is quoted from Loudon for the information of those who would grow the plant in a soil which has no particle of *moorum* in it. Loudon describes it as an “Evergreen.” It may be so in the country from which he writes the description. On this side of India it distinctly sheds its leaves entirely about the time of blossoming. Loudon classes the plant under *Myrtaceæ*. This was right enough according to his lights. To-day we classify the plant under the natural order *Cornaceæ*. There is a sufficient justification for this change according to our lights. Loudon describes the colour of the flowers of *A. decapetalum*, as “*pale-pu*,” which I presume means “pale purple.” If he had said it was “*pale-ru*” instead of

* Natural History of Plants, vol. vi, page 286.

† Encyclopædia, p. 468, article 1068

"pale-pu," I should have supposed that the "pale-ru" was an abbreviated form of the term "*pale-rufous*," which would have been nearer the truth; for I have often observed a reddish or pinkish tinge on the dorsal surface of some of the petals of the flowers just before expanding. This pink tinge is most marked in the petals facing the early morning sun. According to Loudon the plant appears to have been introduced into England so far back as 1779. In concluding my observations on Loudon's description of the plant described by him as *A. decapetalum*, I may add that he considers this plant to be capable of "propagation by cuttings." On this side of India we have no such contingency. The prevailing characteristic of the plant in Thana is that it throws out "suckers." In the vicinity of the plant that is now superbly growing in the compound of the Military Hospital in Thana, there are this day more than half a dozen plants—I should call them trees—which are distinctly the product of the main plant generated by means of "suckers."

It may be observed that the plant described by the elder DeCandolle* as *A. tomentosum* (Lamarek) is more like the Thana plant than any other I have yet seen described, especially as regards the characteristics of the fruit. Witness DeCandolle's own words:

"*Floribus * * * ; ramis inermibus (i.e., having branches without spines), junioribus petiolis nervibusque velutinis foliis oblongis, obtuse acuminatis, subtus vernalis reticulatis. Bacca vel drupa pubescens, cortice pubescens*" (true—K.R.K.) "*livide purpureo*" (true—K.R.K.)

In describing *Alangium decapetalum* (Lam.), Sprengel says it is spinescent. † *Alangium hexapetalum* (Lam.), says he, is spineless; and *Alangium tomentosum* (Lam.) is "*subinermis*" (slightly spineless?), whatever that may mean. All these, says Sprengel, are found in the East Indies. Trimen says that *A. Lamarekii* is occasionally armed with sharp short spinous branchlets.

As observed by Baillon, with regard to the ruminant nature of the albumen, I may add that Dr. Trimen of Ceylon also observes, in describing the seed, that the embryo is "straight in the axis of slightly *ruminant* albumen," and that the cotyledons are foliaceous.‡ It may

* Prodromus : DeCandolle : Vol. III, p. 203.

† Systema Vegetabilium, vol. II, Gottingen, 1825 (classified rightly under "*Polyanthia-monogynia*")—K.R.K.

‡ Trimen's Hand-book of the Flora of Ceylon, Part II, 1894, pp. 285-86. N.O. *Cornaceæ*.

be observed that Dr. Trimen gives June and July as the flowering time of *Alangium Lamarckii* in Ceylon; that its bark is bitter; its heartwood hard and close grained and dark yellow. I have found that in Baillon's illustration, figs. Nos. 247-248 of *A. decapetalum* (at page 272 of vol. VI of his Natural History of Plants) the fruit is marked ribbed. Dr. Trimen distinctly notes that the fruit is not ribbed. This will be amply apparent from my figures of the fruit as copied fresh in the natural condition. Dr. Trimen describes the fruit as "purplish-red." It is a rich "lake" colour as will be seen from the copy of the Thana fruit.

The description of the fruit and seed as given by Baillon (*op. cit.*) is worthy of reproduction here, and may be usefully read in connection with my remarks embodied in the main description of the plant I have already given. It is as follows:—

"Fruit, drupaceous, crowned with calyx or its scar; exocarp thin or thick fleshy; putamen, more or less hard, sometimes crustaceous, 1—2 spermous. Seed oblong; integument thin; albumen fleshy, externally smooth or sometimes sinuate or ruminant; cotyledons of axile embryo foliaceous, digitinerved at base, or flat, or slightly corrugate, or sometimes contortuplicate; radicle terete superior." Let it be noted further that Baillon observes that in the *Alangium* series, though in some flowers the introrse anther dehisces by two longitudinal clefts, these clefts may be looked for right at its margin, *i.e.*, externally instead of in the median line of the anther-cells.* The following observation of Baillon as regards the Ovary may be also usefully quoted here for the help of those who would engage themselves in the work of extended microscopical research:—"The Ovary set in the cavity of the receptacle, and consequently inferior, is unilocular in the true *Alangiums*, and encloses, inserted a little below the summit, a descending anatropous ovule with micropyle primarily superior and exterior, later lateral, afterwards slightly contorted." To this Baillon adds a very important footnote indicating that the ovule has a double envelope. The lucidity and accuracy of this description are my sole apology for such an extended quotation from Baillon. I leave it to the microscopic worker to judge of its utility.

* Baillon's Natural History of Plants; p. 272, vol. VI.

I may observe, in concluding this notice of *Alangium Lamarekii*, that Baillon classes the *Alangium* series under the natural order "*Combretaceæ*." The reader is referred to Baillon's Natural History of Plants itself for his reasons for setting forth such an arrangement. I prefer to accept the classification of the plant under the "*Cornaceæ*."

The plant described as *Pseudalangium* by the venerable Baron Sir Ferdinand Von Mueller under what he terms N. O. *Alangiaceæ*,* appears to be quite a different plant from the one I am describing here. It needs but a passing notice to show that our *Alangium Lamarekii* is not to be found in Australia—not certainly in the colony of Victoria, of which the venerable Baron has been the sole botanical guide for nearly half a century.

The plant prevails on the Coromandel Coast † as will be seen from the description given of it by Roxburgh.

Turning now to the consideration of the remarks of LeMaout and DeCaisne,‡ I may observe that their observation to the following effect is literally correct, namely, that the woody stem is sometimes subterranean, emitting herbaceous branches. My foregone remarks regarding the main tree now standing in the Military Hospital Compound in Thana and many others undescribed by me but existing in the close vicinity of my Military Hospital amply bear me out in my own description of the "suckers," as also in the quotation I now cite from LeMaout and DeCaisne. These joint authors rightly remark that "the leaves of the *Cornææ* are caducous or persistent." They are caducous in the sense that they fall when it is time for the flowers and new foliage to appear. The branches at this time are bare; the leaves fall just before the blossom appears. When the blossom appears there is not a single old leaf on the tree. This is what I have already stated, and I may repeat here to emphasize the chief characteristic of the plant at the time of its renewed foliage. This renewed foliage is the striking characteristic of the plant as the fruit is maturing.

In a small brochure published at Mangalore in 1891, by the Basel Mission Book and Tract Depository, entitled "Five Hundred Indian Plants; their use in Medicine and Arts," at page 68, *Alangium*

* Baron Sir Ferdinand Von Mueller's *Fragmenta Phytographiæ Australiæ*, vol. II, Melbourne, 1860-1861.

† Pl. Coromand., vol. III, p. 79, plate 233.

‡ P. 475 of Mrs. Hooker's Translation.

hexapetalum (Lam.), has for its synonym *Alangium karangolam* (Adans.) classed under family *Alangiaceæ*. At page 71 of the same *brochure* there is the following remark, which is worth reproducing:—"The sage-leaved *Alangium* described by Linnæus is also considered the *Alangium decapetalum* of Lamarck and the *Alangium acuminatum* of Wight."

In a small book, which now seems to be almost forgotten, but nevertheless valuable, published in Bombay so far back as 1840 (2nd Edition), by James Chesson in his "Times Press," under the title of "Manual of Gardening in Western India," and written by Mr. R. Riddell, there is a very important note (at page 71), which I may well reproduce here, fully believing that Mr. Riddell was then noting his personal experience. "*Alangium decapitelum* * (*sic*), native *ankool*," says he, "is a small tree with whitish flowers; *the petals vary on the same tree from six, eight to ten*. The fruit is astringent, but eaten by natives." I quote these remarks with a view to group the *Alangium* species, or call them mere varieties, if you like, under one head, *viz.*, *Alangium Lamarckii*, no matter what the floral envelopes be, as regards the number of their respective parts, on the nature of their development. Dr. Balfour notes, what I have not seen noted elsewhere, that the wood of *A. decapetalum* is said to be peculiarly sonorous.

"In Ganjam," says he, "the leading bullock has a bell of it termed *lodoke* round its neck, the sound being heard to a great distance in the jungle."

POISONOUS PROPERTIES.

Baillon remarks, on the authority of Lamarck and DeCandolle, that "*Alangium decapetalum* and *Alangium hexapetalum* are said to be purgative and diuretic."† Brandis says that the root is aromatic. As will be seen from my remarks later on, I have sufficient reason to believe that the bark of the root is poisonous. Only remember, pray, that I use the word "poisonous" in its widest sense. It has distinctly dangerous emetic properties, followed by a weakened action of the heart. Here may be noted what I gather from the celebrated Rheede of sacred Botanic memory. Rheede says,‡ in sufficiently distinct terms, that "the root is *acrid* and bitter." The words used as regards odour in Rheede's work, written in Latin, are "*Odor gravis*." I

* The proper word is *decapetalum*.—K.R.K.

† Baillon's *Natural History of Plants*, vol. vi, page 279.

‡ *Hortus Malabaricus*, vol. iv, pp. 55 56, tab. 26.

have found that some English writers say, in translating these words, that the odour is "*heavy*." I do not know whether to an Englishman or to a Briton, I should say, the word "*heavy*" is capable of conveying the exact sense of the Latin term "*gravis*" when it is made to mean "*heavy*." Here for a moment I may crave the indulgence of my strictly Botanical reader if I venture to try and determine the meaning of the Latin word "*gravis*" as used by Rheede with reference to the odour of the root bark, or, for the matter of that, the odour of anything whatsoever. I may here state, for the information of such of my readers as do not know Latin, that the Latin adjective "*gravis*," as applied to smell or flavour, means "*strong*," "*unpleasant*," or "*offensive*." The English rendering of it, as used by some in the word "*heavy*," conveys no meaning. According to the Latin Lexicographer Andrews, to whom, since 1866, I am much under obligation for my limited knowledge of Latin, the term "*gravis*" also means *bitter*. This meaning is implied in the works of M. Terentius Varro, a Roman writer on Husbandry, who flourished in the last century before the Christian era. According to Rheede, the *taste* of the leaves is acrid, but they have no *odour*. It may be noted in passing that the description of both Lindley and Brandis, to the effect that the root of *Alangium Lamarckii* (be it known under any of the synonyms I have detailed above) is *aromatic*, appears to conflict with the description of it given by Rheede. No Latin lexicographer has, so far as I know, given to the Latin word "*gravis*" the English equivalent of "*aromatic*." Here I crave the assistance of better Latin scholars, indifferent and poor as I am in my knowledge of the Latin tongue, which I studied thirty years ago, and of which I am no better master now than I was then. In describing the root Brandis is, in my opinion, more accurate (as he always is in all his Botanical utterances) when he says that the root is *aromatic*—for I do not think that the odour of the root is in any way "*strong*" or "*unpleasant*"—I can positively say it is not "*offensive*."

With regard to the action of the root on the alimentary canal, Rheede distinctly says it is cathartic. It produces, says he, serous and cathartic discharges from the intestinal canal.* If such is the

* In the original Latin text of Rheede the term "*alvus*" is used, which I think means not only "*the belly*" or "*abdomen*," but also the "*stomach and entrails*." "*Astringere alvum*" (Celsus I, 3) means to "*make costive*," i.e., to bind the entrails—produce constipation.—K.R.K.

experience of Rheede, and of those indigenous learned writers who gathered for him their ancient knowledge as found prevalent on the Malabar Coast, from whence he wrote in days gone-by, I may say that I cannot but congratulate myself, at the present day, in my own experience as regards the poisonous nature of the root-bark, *nay even the entire root*, on this side of Western India. Rheede wrote in his day, strengthened by the researches of his native co-workers. I am writing in my day with the help of past experience, but without the special help of any co-worker. I wish I had the help to-day that Rheede commanded when he worked on the Malabar Coast. All the more do I express this wish, for I feel that there will be some who will question my taste in including this plant under the "poisonous head." But I fear no contradiction, as I crave for more co-operation in determining the poisonous nature of the root-bark of *Alangium Lamarkii*; and I wish to specially point out a dangerous property in the root-bark which has not been yet experienced or specifically recognized by the recognized writers on Indian Toxicology who have preceded me. Rheede notes that the fruits are seldom eaten. "For," says he, "they heat the blood exceedingly." "Heating the blood" is a popular expression in India, and as I fear Rheede was only copying an expression of those natives of Malabar who helped him in his botanical researches, he has fallen into a popular error which is easily pardonable. Nevertheless such an error is misleading to a student of Pharmacology and Physiology trained in an English or European school in the nineteenth century. I am not yet able to understand what the term "heating the blood" means. Perhaps it is my ignorance, and Rheede in his day knew better. All I can say is that, without the slightest fear of heating their blood, the Thana boys devour the fruit greedily. It is a distinct seasonal treat to them, judging from the avidity with which they devour the ripe fruit. Rheede's native reporters might have represented to him, according to their lights, possibly dim, that their native brethren "seldom ate" the fruit in Malabar. Possibly the tastes of their brethren in Malabar differed from those of my co-inhabitants of Thana. But that does not go to prove that the fruit of *Alangium Lamarkii* should be declared absolutely inedible. In support of my view regarding the edible nature of the fruit, I may quote DeCandolle. He says pointedly that the fruits of the entire *N. O.*

Alangiaceæ are edible. Such is my experience ; or rather my recent experience supports DeCandolle's earlier observation. Lindley* observes that the Malays attribute purgative and hydrogogue properties to *Alangium decapetalum* and *Alangium hexapetalum*.

One word more with regard to the edible and non-poisonous nature of the fruit. I can cite two very eminent Botanists who hold the view that the fruit is absolutely free from any poisonous or "blood-heating" properties so-called. Royle repeats the opinion of Lindley that the fruit is edible. Dr. Wight also says that the fruit of the *Alangiums* "is eatable, but not palatable, being mucilaginous and insipid." I may add that Brandis and others state that the fruit has a somewhat sweet and astringent taste. Such is my own experience. "The nucleus," says Rheede, "is bitter-sweet ;" I can say that it is so.

It is well worth noticing here that instances of fruits of plants being edible, and on the other hand their roots being emetic, are not unknown. I have distinctly referred to one marked instance given by Mr. W. Bartlett† in one of my former papers in connection with this series (*vide* my paper on *Moringa pterygosperma*, in Vol. ix, p. 168, of this Journal). Mr. Bartlett refers therein to the dangerous sickness caused by eating the root of the French Bean plant.

In detailing the properties of *Alangium decapetalum* (Lam.), classed under *N. O. Alangiaceæ*, Colonel H. Drury observes‡ that "the juice of the root is reckoned anthelmintic and purgative. It is also employed in dropsical cases, and, pulverized, is a reputed antidote in snake-bites." This is a quotation from Roxburgh ; but neither Roxburgh nor Drury mentions specifically whether the root is an antidote to the poison of the "colubrine" or of the "viperine" snakes. Symptoms of poisoning vary in each case, as is well known to those who have devoted special attention to this subject. For years past the term "snake-bite" has been very vaguely used, and passes muster in the eyes of those who would pose as discoverers of a cure for the deadly cobra-bite, *i.e.*, the bite of the genuine *Naja trepudians*.

* Treasury of Botany, vol. i, p. 720.

† Pharmaceutical Journal, vol. ii, p. 721, 1st Series.

‡ The Useful Plants of India : London, 1873, 2nd Ed., p. 24. [Observe that in this work *A. tomentosum* (DeC.), and *A. hexapetalum* (Roxb.) are cited as synonyms.]—K.R.K.

Surgeon-General E. Balfour of Madras also states* that the aromatic roots of *A. decapetalum* [synonyms *A. hexapetalum* (Roxb.), and *A. tomentosum* (Lam., D.C.)] are used by natives in snake-bites. This observation has the same vagueness to which I have just referred above. Surgeon Lee of Mangalore † distinctly says, however, that powder of the bark (40 grains made into a bolus) is given in cases of cobra-poisoning. He is not decided, however, in saying that it is a cure. He remarks that the root is well worth trying in cases of cobra-bite.

The following observations from the writings of Hindu writers may be usefully read in connection with the properties of the plant under notice. According to the quotation from Shiva Datta given by Katā Bhat of Junagadh (*vide* his compilation entitled "Nighant Sangraha," p. 123), the spine-bearing, white-flowered, red-fruited *species*, or call it *variety*, if you will, has a thick root, which is distinctly cathartic and emetic. In Narhar Pandit's Rāj-Nighanta, it is mentioned that the oil expressed from the seed also is cathartic (*vide* p. 84, Benares Edition, 1883). In Madan Pāl's "Nighanta" (Calcutta Edition of Shri Bhuvan Chandra Basu, 1886, p. 13), the plant is supposed to possess hypercathartic properties. In the yet more recent work known to Marathi readers as "Nighanta Ratnākara,"‡ it is stated in five Sanskrit *shlokas* (stanzas) that the juice of the entire plant is emetic and highly purgative, *i. e.*, productive of watery, alvine discharges. The authorship of the *shlokas* is not declared, but I think we may safely believe that they convey the experience of the ancients. In passing, I may observe that in this work the juice of the plant is credited with the property of curing the poisonous bites of bad snakes, and also those of "dogs, mice, and cats!" Rather a large order this, and of doubtful curative powers. The writer goes further, and credits the juice of the plant with the still more doubtful property of driving the devil (Sanskrit—*Pishāch-pīḍā*) out of human kind! I know no individual of the vegetable kingdom yet that can be said to possess such a quality. The "devil" may be safely said to have it all his own way, in spite of the curative resources of the vegetable kingdom. The "devil's kingdom" is unassailable by the members of the vegetable world.

* The "Encyclopædia" of India, vol. i, p. 63; 3rd Ed., London.

† See Watt's Dictionary of the Economic Products of India, p. 154, vol. i, 1889, Calcutta.

‡ Published in Bombay in three volumes in 1867 by Vishnu Vasudev Godbole. (See pp. 20, 21, vol. i.)

The cathartic properties of this plant are also referred to in "Dhanvantari Nighanta" (*vide* p. 60, *shloka* 250, advanced proofs, Edition Ānandāshram Series of Mr. M. C. Apte). So far as I know, Bhāv-Misra does not allude to this plant in his celebrated work entitled "Bhāv-Prakāsh."

Coming to the later indigenous writers of our own generation we have the following information. Jaikisson Indrajī maintains distinctly that in large doses the root-bark is emetic, but he adds that it is safe. In this I fear he follows Mooideen Sheriff, and has no special clinical experience of his own to guide him. Dr. Sakham Arjun does not refer to any of the cathartic or emetic properties of the plant. When he dismisses his note on this plant in his Catalogue of the Bombay Drugs in the brief manner he does, one can gather he had no personal knowledge of the use of the plant. It certainly does not grow in Bombay; and when, in 1882, he saw it with me in the Thana Military Hospital, some years after he had published his Catalogue, he admired the tree immensely—the true lover of beautiful plants he ever was. A younger indigenous writer of the present day is Dr. Virjī Zinā Rāval, L. M. and S., of the Bombay University. He notes in his Gujarati work named "Arya Aushadha" (p. 169, 1889, Ahmedabad) that the root is diaphoretic and emetic; for the former purpose smaller doses suffice (1 to 2, *wāls*); for the latter $\frac{1}{4}$ tola is required.* "As a purgative," says he, "the dose is up to one *wāl*."

To Honorary Surgeon Mooideen Sheriff of Madras is due the credit of having brought to the notice of the profession of our day the emetic properties of the root-bark of *Alangium Lamarkii*. The first reference to this experience of Mooideen Sheriff appears to have been made by Dymock so far back as 1879† in the Pharmaceutical Journal of London. Watt has subsequently referred to the same in his "Dictionary of the Economic Products of India."‡ The emetic properties referred to are mentioned by Mooideen Sheriff in his supplement to the "Pharmacopœia of India." He says that "*the root-bark has proved itself an efficient and safe emetic in doses of fifty grains; in small doses it is*

* A tola is 48 *wāls*; a *wāl* is about $4\frac{1}{2}$ or 5 grains.

† Vol. ix, 3rd Series, 1878-79, p. 1017. (The same reference is repeated by Dymock in the "Pharmacographia Indica," *vide* vol. ii, pp. 165-66.—K. R. K.)

‡ *Vide* vol. i, pp. 154-155.

nauseant and febrifuge” (the italics are mine.—K. R. K.). The following quotations, marked (a) (b) and (c) from Watt’s “Economic Dictionary” (pages quoted), may be usefully read in connection with Mooideen Sheriff’s remark just quoted by me in italics:—

(a) “In an official correspondence forwarded by Mooideen Sheriff to the supreme Government regarding the Pharmacopœia of India, Dr. Mooideen Sheriff says further of this drug: ‘It possesses the emetic and nauseant properties of ipecacuanha.’” (b) “It is a good substitute for ipecacuanha, and proves useful *in all the diseases* * in which the latter is indicated except dysentery.” (c) “Doses as an emetic from 45 to 50 grains; as a nauseant, diaphoretic and febrifuge from 6 to 10 grains; and as an alterative tonic from 2 to 5 grains.” These points will be referred to later on. There is one observation in Watt’s citations in his Dictionary from writers who have helped him in the compilation of his cyclopædic work, which I cannot pass unnoticed: “Surgeon Joseph Parker, M. D., Poona,” as he then was, is a well known brother-officer of the Indian Medical Service, now a Surgeon-Lieutenant-Colonel, and the Medical Store-keeper of Bombay. On the testimony of this officer, not sanctioned by personal experience, as the officer himself candidly says, Watt enters in his dictionary a remark which I think is of doubtful accuracy. It is to the following effect:—“The oil of the root-bark is said to be a useful external application in rheumatism.” Should this happen to meet the eye of Surgeon-Lieutenant-Colonel Parker, I should like to know if he is still of the same opinion; and I should be thankful to know if I am wrong in maintaining the view that, botanically speaking, there is no source for any oil in the structure of either the root or the root-bark. So far as I can ascertain at present, I might say that one might as well “by repeated efforts extract oil from the sea sand” (as the Marathi proverb goes) as expect to get any oil from either the root or root-bark of *Alangium*.

With reference to the quotations (a), (b) and (c) cited above from Mooideen Sheriff, I may dispose of his remarks under (b) and (c) by saying that they refer to points which I cannot very well discuss in this journal by unnecessarily occupying its pages on purely medical

* The italics are mine.—K. R. K.

and clinical questions. Other journals of a less popular character are open to me for a discussion, which could hardly be expected to be of any importance or use to the readers of this journal. I wish to direct my remarks in the following pages to what I consider the kernel of my observations under the head of *poisonous* properties in the description of this plant.

The chief point, then, that I wish to impress upon the readers of this journal is that, recognizing, as I do fully, the emetic properties of the root-bark, I have sufficient reasons, from personal experience, to be able to say that, although the root-bark may, and does in my experience, prove an efficient substitute for ipecacuanha as an emetic, I cannot endorse the opinion of Mooideen Sheriff "that it is safe in doses of even fifty grains." I would rather use ipecacuanha as an emetic—certainly not *Alangium* root instead. The officinal dose of ipecacuanha powder as an emetic is 15 to 30 grains. Dr. A. B. Garrod* distinctly says that "in large doses it has considerable power in lowering the circulation." This veteran therapist includes the drug amongst those that act as *sedatives on the vessels and capillary system*. Dr. Lauder Brunton says† that "ipecacuanha is one of the drugs which, while it increases the secretion of the lungs and bronchi generally, tends to lessen the blood-pressure." In the earlier portion of his work (p. 219) he says, with regard to *Emetin*, which is the uncrystallized active principle obtained from ipecacuanha, that, "when injected either subcutaneously or into the veins, it produces death by *cardiac paralysis*. It paralyzes the vessels first and then the heart, so that the blood-pressure sinks to zero, while each cardiac pulsation is still powerful." Dr. Ringer‡ says "that in large doses it produces both nausea and vomiting, and, like other emetics, some *general weakness with sweating*." On the authority of M. Chouppe and Dyce-Duckworth, Dr. Ringer further says that "emetin acts through the terminations of the pneumogastric nerve," and that it "without doubt enters the blood." According to Dr. Ringer, ipecacuanha is a distinct depressant.

Sir Robert Christison, writing so far back as 1845, considers that *emeta* (which is the term he uses for *emetin* of the present day) "is a

Materia Medica, p. 396, 3rd Ed., 1868.

† Pharmacology, 1885, p. 867.

‡ Therapeutics, 1880, 8th Ed., pp. 406 to 419.

powerful poison. Two grains of the pure alkaloid will kill a dog; and the symptoms are frequent vomiting, followed by sopor and coma, and death in fifteen or twenty-four hours. In the dead body the lungs and stomach are found inflamed. The same effects result from injecting it into a vein, or applying it to a small wound (*Magendie*). It appears then to be a narcotico-acrid. But its irritant properties are so prominent that it might be properly arranged with the vegetable acids.”*

Dr. Alfred S. Taylor, in his work on Poisons,† makes the following remarks regarding *emetin*:—“Pelletier and Magendie found that from 6 to 10 grains of the impure alkaloid given to animals caused violent vomiting, followed by stupor and death in about fifteen minutes. On inspection the alimentary canal was observed to be inflamed.”

I should not have deemed it fair to occupy the attention of my readers with such elaborate quotations on the poisonous properties of *emetin* did I not think that the active principle of *Alangium Lamarckii*, from my experience of fifteen years, possesses in a pre-eminent degree the properties of *emetin*, whether as a vascular sedative or as a “narcotico-acrid” as very appropriately termed by Christison. In my experience the root-bark powder of *Alangium Lamarckii*, besides being a sure emetic, has a decidedly more powerfully sedative effect on the human heart and blood vessels. It is besides productive of violent irritation of the mucous coat of the stomach, followed by gastric catarrh lasting many days.

The recent researches of the writers of the “Pharmacographia Indica” (Dymock, Wardell and Hooper‡) have, happily for me, isolated a very bitter non-crystallizable alkaloid, which they have provisionally called *alangine*. It is to be hoped that, now that Dr. Dymock is gone, Dr. Wardell and Mr. Hooper may be able to establish the identity of *Alangine* with *Emetin*. I leave it to other future investigators also of the pharmacological properties of Indian plants to decide this point.

“The bark of Dogwood,” a congener of *Alangium*, especially of *Cornus florida*, say Le Maout and DeCaisne,§ “is bitter and astringent.”

* A Treatise on Poisons, p. 892, 4th Ed., Edinburgh.

† Ed. of 1848, p. 759.

‡ Vide p. 166, vol. ii.

§ Mrs. Hooker's Translation of their General System of Botany, 1873, page 477.

gent, and yields a principle (*Corniine*), which is administered in North America instead of quinine." Note that the recent researches of Sohn term this active principle *Cornin*.^{*} It is neutral and bitter, and consists of crystalline silky needles, soluble in water, alcohol, or ether. (*Ann. Chem.*, Ph. 14, 206, &c.) It does not appear to possess any poisonous properties.

The next question I would suggest to future workers in pharmacology is as to whether *alangine* can be classed under the group of *Saponins*,[†] which in small doses cause symptoms in man "closely resembling the nauseant stage of emesis, that is, a raw feeling in the throat, tendency to cough, and increased secretion of mucus."

To sum up, the result of my experience is that, even although the root-bark of *Alangium* is a safe substitute for ipecacuanha as a mere emetic, as stated by Mooideen Sheriff, it is a more powerful cardiac sedative than ipecacuanha is reputed to be. As compared with ipecacuanha, I think *Alangium* is a tardy and not a prompt emetic. From the very fact that ipecacuanha is a prompt emetic, one may consider it safe, as it does not remain in the stomach, but is discharged from it before a large quantity of it has time to be absorbed by the blood. Emesis being slow in *Alangium*, the root-bark of it has more time to be absorbed by the blood. Hence, probably, its pronounced action on the cardiac inhibitory nerves.

^{*} Dictionary of the Active Principles of Plants : London, 1894, page 45, § 79.

[†] Schmiedeberg's Pharmacology (translated by Dixon, 1887), page 68.

SOME FURTHER NOTES ON THE GENUS *TERIAS*.

BY CAPT. E. Y. WATSON, Indian Staff Corps.

(Read before the Bombay Natural History Society on 14th Jan., 1896.)

In a paper entitled "Notes on the Synonymy of some Species of Indian *Pierinæ*," published in the Society's Journal, vol. viii, page 489, (1894), I stated on page 517 that I was unable to suggest to what species certain forms of *Terias* described under the names *T. sodalis*, *T. contubernalis* and *T. andersonii*, all of Moore, should be assigned, as the forms were not represented in the British Museum, on which collection the paper was based. The above-named forms, together with some others, were described by Mr. Moore in a paper on Butterflies from the Mergui Archipelago, published in the Journal of the Linnæan Society, Zoology, vol. xxi, page 29, (1886), and through the instrumentality of Mr. de Nicéville I have been enabled to examine the actual specimens which were described, which are in the collection of the Indian Museum at Calcutta, in addition to which Mr. de Nicéville has sent me over 500 specimens of *Terias* from his own collection to assist me in working out the affinities of the different forms.

In the present paper I therefore propose to discuss the distinctness of each species mentioned by Mr. Moore, and to try to point out what corrections should be made in their synonymy owing to our recently-acquired knowledge of the seasonal variation which occurs in the genus.

The following are the species mentioned by Mr. Moore:—

"*TERIAS FORMOSA*, Hubner." This, as I have already pointed out, is a synonym of *T. harina*, Horsfield.

"*TERIAS SODALIS*, n. sp." In describing this species, Mr. Moore says it differs from typical Javan and Sumatran *T. sari*, Horsfield, in being smaller, and in some slight differences in the markings. However, none of the points of distinction given holds good. Mr. Moore gives the expanse of his *T. sodalis* as from 1.4 to 1.5 inches. I find from actual* measurement of the specimens described

* It is probable my method of measurement is not the same as Mr. Moore's, which would account for the discrepancy between the measurements given by him and by me of the same specimens.

that they vary from 1.4 to 1.7 inches, the female "type" expanding 1.6 inches, while of some twenty Javan and Sumatran specimens of *T. sari* available to me, one expands only 1.1 inches and the remainder vary from 1.5 to 1.9 inches. The only other character of any importance given by Mr. Moore is the relative breadth of the black margins on the upperside, and though, as far as the material goes, Javan and Sumatran specimens are slightly more heavily marked than specimens from Mergui and other parts of Burma, yet this character is so well known to be eminently variable in other species of the genus that it cannot be accepted as specific without the very greatest hesitation. *T. sari* is a very constant and easily recognisable species: it has on the underside only a single wavy line in the discoidal cell of the forewing, in addition to the usual disco-cellular markings, and the whole of the apex widely and evenly chocolate-brown, and also has a more or less diffused dark spot towards the outer angle.

"*TERIAS SILHETANA*, Wallace." The Mergui specimens are quite typical *T. silhetana*, which can be readily recognised by having three markings in the discoidal cell on the underside, in addition to the marking on the disco-cellular nervules, this being a character found in no other described species of the genus. I may add that, since the publication of my previous paper, Messrs. Davidson and Bell have bred *T. silhetana* at Karwar in the Bombay Presidency, and have obtained all its seasonal forms. They inform me that the caterpillar differs from that of *T. hecabe* in having a black head instead of being uniformly green, and further that it is gregarious in its habits, whereas the caterpillar of *T. hecabe* is solitary.

"*T. HECABEOIDES*, Ménétrières." The Mergui specimens are typical *T. hecabeoides*, which grades into and is inseparable from *T. hecabe*.

"*T. CONTUBERNALIS*, n. sp." The Mergui specimens belong to the ordinary dry-season form of *T. hecabe*, which has also been described by Mr. Moore under the names *T. excavata* and *T. simulata*.

"*T. PATRUELIS*, n. sp." This is also the ordinary dry-season form of *T. hecabe*; it has the dark marginal border on the upperside of the hindwing rather narrower than in *T. contubernalis*, but all the specimens vary *inter se*.

"*T. FRATERNA*, n. sp." Of the four specimens labelled *T. fraterna* in Mr. Moore's handwriting, one is quite typical *T. hecabeoides*, and the other three are again the ordinary dry-season form of *T. hecabe* and might be equally well arranged under either *T. contubernalis* or *T. patruelis*. Neither *T. fraterna* nor *T. patruelis* has been correctly identified in the British Museum collection, where rather different dry-season forms of *T. hecabe* from North-West India have been identified under these names, as will be seen by a reference to the key to the genus given in my previous paper. This misidentification is, however, of very small importance, as the forms described by Moore and those identified in the British Museum are all nothing more than slight variations in the dry-season form of *T. hecabe*.

"*T. MERGUIANA*, n. sp." This has also been wrongly identified in the British Museum, where the ordinary rainy-season form of *T. silhetana* is arranged under this name. True *T. merguiana* is a form of *T. hecabe*, with the typical form of which the male type agrees in the markings of the underside, but on the upperside of the forewing the dilatation of the black margin at the outer margin, instead of being squared, has its inner edge inclined obliquely outwards. This is a character also found in *T. silhetana*, as well as in many forms of *T. hecabe*, e.g., *T. swinhoei*. It is curious to note that of the six specimens labelled *T. merguiana* by Mr. Moore, three are without apical markings on the underside of the forewing, while the other three (one of which is the female "type") have these markings more or less developed. *T. merguiana* is the commonest form of *T. hecabe* found in Sumatra, and grades imperceptibly into the typical form.

"*T. ANDERSONII*, n. sp." This appears to be a quite distinct species; it is the *T. kana* of the British Museum, but not of Moore; it is also therefore the species previously referred to by me as *T. kana*, and is also the species recorded under that name from Sikhim by Mr. de Nicéville, on my identification, in the "Gazetteer of Sikhim," 1894, p. 167, n. 424. I find, on enquiry, that I was mistaken in supposing that the single specimen of this species in the British Museum was labelled "*T. kana* type;" the true type of *T. kana* is now before me, and is referred to below. In *T. andersonii*, as in *T. merguiana*, Mr. Moore allows considerable variation, and if he had treated the

species as he has treated *T. hecabe*, he might easily have made two if not more "species" out of the six specimens of *T. andersonii* in the Indian Museum.

"*T. KANA*, n. sp." This is another form of *T. hecabe*, differing from those described above in having a broader black margin on the upperside of the hindwing.

I would therefore make the following additions and corrections to my previous paper :—

T. sodalis, Moore, is a synonym of *T. sari*, Horsfield.

T. contubernalis, Moore, is a synonym of *T. hecabe*, Linnæus.

T. merguiana, Moore, is also a synonym of *T. hecabe*, and is not the rainy-season form of *T. silhetana*, Wallace, as identified in the British Museum.

T. kana, Moore, is also a synonym of *T. hecabe*, and is wrongly identified in the British Museum, where *T. andersonii* stands as *T. kana*.

T. andersonii, Moore, is a distinct species, and is the *T. kana* of the British Museum and of my previous paper.

ORNITHOLOGICAL NOTES FROM THE COCOAWATTE ESTATE, LUNUGALA, IN THE PROVINCE OF UVA, CEYLON

BY A. L. BUTLER.

(Read before the Bombay Natural History Society on 14th Jan., 1896.)

I venture to hope that the following paper, embodying my observations on ornithology during a year in a district of the province of Uva, Ceylon, may not be altogether without interest to Naturalists.

I have given rather lengthy notes on the breeding of species whose nidification is not described in the second edition of "Nests and Eggs of Indian Birds," such as the Ceylonese hornbill and Layard's woodpecker, and on other such interesting birds as the crested tree swift, the Malabar trogon, the frog-mouth, etc ; but I hope my observations will possess sufficient interest to atone to some extent for their length. If one does not depart occasionally from the "very common, breeds, eggs white" style of note, it is almost impossible to make a paper readable. Subsequent workers in Ceylon are immensely indebted to Colonel Legge for his charming book on the birds of the island, which makes the study of its avifauna very easy for them ; and the completeness of Colonel Legge's work is such that in the fifteen years since his book was published, only three species have been added to his list—*Asio accipitrinus*, Pallas, a hen-bird from Jaffna, Nov. 1891 ; *Coturnix coromandelica*, Gmelin, obtained at Colombo in 1883 ; and *Alcedo beavani*, Wald., procured by Mr. A. P. Green near Dambool in 1892, and subsequently obtained by him in other localities and by myself in this district as noticed in these notes.

The centre from which I write is the Cocoawatte Estate, four miles from Lunugala, in the Uva Province. I have confined my notes to the birds observed and positively identified within a radius of ten miles from the estate, excluding the species I have met with a little further off, and even as it is the total number noticed, 161 species, is a large one, and shows the locality to be very rich in bird-life. The piece of country dealt with slopes down from the district of Madulsima (4,500 ft.) to Lunugala (about 2,500 ft.), and then over two low ranges of hills to the village of Madigama (1,000 ft.), the lowest point alluded to in this paper.

Very briefly speaking, this tract of land consists in the higher parts of jungle and tea estates; then of undulating patna-land and rocky hills covered with Maana-grass, and intersected with jungle dells wherever there is a stream; and lower down of blocks of forest dotted with numerous Kurrakan clearings, large sheets of "lantana" scrub, extensive paddy-fields, and native gardens.

One thing I must remark on is the extraordinary destruction of small birds' eggs which goes on in the jungles. In two cases out of three, a nest left with eggs is empty when revisited next day, and many a good egg I have lost by waiting to secure a complete clutch. The chief offenders appear to me to be squirrels and lizards, and probably jungle-cats, the black kite-eagle, the rat-snake, and the little nocturnal loris do their share of nest-rifling as well.

Nor do the birds fare much better on the open patnas, as the natives always burn these off in the dry weather (just the breeding season) to produce a supply of young grass for their cattle, and among the nest and young of such species as *Francolinus pictus*, *Perdicula asiatica*, *Turnix taigoor*, *Drymceca insularis*, *D. valida*, etc., these extensive fires must work inestimable havoc.

I will now proceed with my notes on the different species of birds observed; it must be remembered that I have only been a year in the district, and my list must of necessity be far from complete.

1. *Circus aeruginosus*, Linn., the Marsh Harrier.—Common about the paddy land at Madigama (1,000 feet.) in N.-E. monsoon.

2. *Circus macrurus*, Gmel., the Pale Harrier.—Common all over the district in N.-E. monsoon. Young birds far outnumber adults.

3. *Astur trivirgatus*, Temm., the Crested Goshawk.—Not very common as far as I know. I have only killed a few specimens.

4. *Astur badius*, Gmel., the Indian Goshawk.—I found four nests this season; from one I secured a clutch of three fresh eggs on April 30th; another nest found in May contained three eggs on the point of hatching and useless; the third contained three youngsters in down; the fourth nest was inaccessible.

5. *Neopus malayensis*, Temm., the Black Kite-Eagle.—There are generally one or two of these fine birds sailing about the hills here, but I do not know where they breed. One I killed contained the remains of a bat.

6. *Spizatus ceylonensis*, Gmel., the Ceylon Hawk Eagle.—Have seen it here occasionally, but have not killed one.

7. *Spilornis spilogaster*, Blyth, the Ceylonese Serpent Eagle.—Plentiful ; the commonest eagle in the Ceylon hills, where its squealing cry is one of the most familiar of bird notes. I knew of two nests this year—one was on a single tall tree standing in a sheet of lantana scrub at Madigama (1,000 feet.) This nest was found on May 11th, 1895 ; it was loosely constructed of sticks, with a handful of green leaves under the egg. This was considerably incubated, but made a good specimen. Size $2\frac{1}{2}'' \times 1\frac{1}{8}''$, ground-colour dirty white with a group of rusty-red stains and blotches forming a sort of cap at the small end. The second nest noticed was on one of a scattered group of trees on a steep patna hillside at about 2,500 ft. elevation. A cooly sent to visit it reported two young eaglets ; he said they were quite small, but the nest was empty when revisited a few days later. This nest was also found in May.

8. *Elanus cæruleus*, Desf., the Black-winged Kite.—Resident but not nearly so numerous as on the Uda-Pusselawa side of the province. Never found a nest.

9. *Pernis ptilonorhyncus*, Temm., the Indian Honey Buzzard.—Have seen it here once or twice. Have shot it as high as 5,000 feet in Uda-Pusselawa.

10. *Cerchneis tinnunculus*, Linn., the Common Kestrel.—Common in the N.-E. monsoon.

11. *Ketupa ceylonensis*, Gmel., the Brown Fish Owl.—Fairly common up to 2,500 feet. I was told of a nest about five miles from here this May, but the man I sent to inspect it reported that the young had flown. I have a fine pair of these owls in an aviary, and they are most interesting birds to watch. They bathe every morning regularly, and, as Colonel Legge remarks of *Syrnium indrani*, "put their feathers into trim afterwards by leading them out from base to tip and working them with a quick movement of the under mandible." When angry they spread their wings and ruffle up all their feathers until they look a tremendous size, inflating their white throats until there seems as much of the bird's face below the bill as above it, and all the time growling savagely exactly like a dog, and snapping their bills. This demonstration, however, they are not nearly so much

given to as my live *Glaucidium castanonotum*. Pieces of food too large to bolt they hold up in one foot exactly like a parrot. As Colonel Legge says that, as a rule, owls do not utter their natural calls while in confinement, it may be worth mentioning that this species does so. My pair keep up the "hoom-oh-hoom!" all night, and a wild outsider frequently visits the trees near their cage and joins in!

12. *Scops bakkamuna*, Forster, Forster's Scops Owl.—Fairly common. I hear its "wok-wok" every night, but do not see much of the bird, which seems strictly nocturnal. On May 25th I found a nestling unable to fly in the tea quite close to my bungalow. Where he was hatched I could not make out, as I could find no likely hole in any of the neighbouring trees. I kept the chick for about three weeks, and he seemed to be doing well, but one morning I found him dead. Its call note was different from that of the old birds—a low "ook-ook."

13. *Ninox scutulata*, Raffles, the Brown Hawk Owl.—Common at 2,000 feet; much more so down at Madigama. My collecting coolie shot a male in April, and at the shot a second bird flew out from a hole in the same tree. The hole was empty, but as the testes of the male bird were much enlarged, I suppose they would have laid in it shortly. I have always found this bird very shy. After quitting its place of concealment during the day, it strikes off on a foraging expedition, taking exactly the same line night after night, and stopping to utter its "coo-whoop" on the same trees.

14. *Glaucidium castanonotum*, Blyth, the Chestnut-backed Owl.—Common. Extremely diurnal in its habits, uttering its queer little hoot of "kraw" all through the day. I believe it feeds during the day too, as I once shot one at 11 A.M., which had, I am almost certain, a mouse in its claws. However, it dropped the object in fluttering down through the jungle, and I could not find it to make sure. Previously I thought it lived entirely on insects. But one which I have alive eats birds in such a business-like way (carefully plucking out the wing and tail feathers and then beginning with the brain) that I fancy they must form a regular part of its food. My bird was first pinioned by a shot, and the plucky little fellow was eating meat from my fingers three hours afterwards, and shutting his eyes and bending his head down with apparent pleasure when I scratched it. When alarmed it throws

itself on its back and snaps its bill rapidly. This species is not a shy bird, and walking quietly one can generally get close up to it without difficulty.

15. *Syrnium indrani*, Blyth, the Brown Wood Owl.—Fairly common. Its hoot heard close is “oot-oot-to-whoo,” but the two first notes are jerked out in a very low tone and at a very short distance only the “to-whoo” is audible. This species is generally credited with being the “Devil Bird,” but I do not think so myself. Whatever the “Devil Bird” is, it is resident in this valley, and, though I hear it nearly every night in the year, all my attempts to shoot or even see it have been in vain, as it always slips quietly off when stalked. The note I have heard is not particularly uncanny, and is evidently what Mr. Mitford described (Tennent’s Nat. Hist. of Ceylon, p. 248) as a “magnificent clear shout.” I should say “wailing shout” myself. My collecting coolie, who has spent whole nights after it, got close up to it once, but the cartridge missed fire, “proof,” as the man said shewing the deeply dented cap, “that it *was* a devil!” He said it was “bigger than my fish-owls;” this, and the fact that the mysterious cry is so loud and powerful, makes me believe that *Bubo nipalensis* is most probably the bird. It can hardly be even a breeding seasonal cry of such a common bird as *Syrnium indrani*, or every one in the island would have heard it again and again. In other districts where *S. indrani* is common I have never heard it, and as I hear the cry here at all times of the year, I take it to be the regular call of some other species, more especially as I seldom hear the ordinary note of the Wood Owl in the particular jungle from which the extraordinary cry usually comes. I hope to shoot the bird some day and settle the question. In my opinion it will turn out to be *Bubo nipalensis*, or, failing that, *Phodilus assimilis*.

16. *Palæornis eupatrius*, Linn., the Alexandrine Parrakeet.—Common at 1,000 feet, above which I have not seen it.

17. *Palæornis cyanocephalus*, Linn., the Blossom-headed Parrakeet.—Very common and ranges up to 5,000 feet. Found a nest with one egg in May, but something destroyed it.

18. *Palæornis calthropæ*, Layard, Layard’s Parrakeet.—Very common; took a clutch of four eggs in May (averaging $1\frac{1}{8}'' \times \frac{9}{10}''$), and

found nest with three young on April 23rd. I have heard of five eggs in a clutch,

19. *Loriculus indicus*, Gmel., the Ceylon Lorikeet.—Very common; breeds here from March to June, during which months I took a few clutches of eggs this year. The bird generally makes use of some small natural cavity in a tree, inside which, if the wood is soft, it usually excavates a downward passage from 2 to 4 feet in depth. In all the nests I examined the eggs were laid on a pad about an inch thick, composed of fresh green leaves and halves of leaves torn off lengthwise along the midrib. The eggs are two to three in number, broad dull white ovals, but they soon become marked with faint greenish stains from the juices of the leaves on which they are deposited. Two eggs measure $3\frac{1}{16}'' \times \frac{5}{8}''$ and $\frac{3}{4}'' \times \frac{5}{8}''$. I was struck with the rapidity with which the Love-birds passed up and out of their nest passages when alarmed on their eggs. In one case the bird always darted out simultaneously with my tapping the tree with a stick, exactly as if it had been sitting just inside the entrance when disturbed; and yet her eggs were four feet below it down a tunnel about 3 inches in diameter, up which she had to pass to effect her escape. In all cases the trees chosen were rather small ones standing in the open. The nest-holes were 5 to 15 feet from the ground.

20. *Picus mahrattensis*, Lath., the Yellow-fronted Woodpecker.—Not uncommon at 1,000 feet.

21. *Yungipicus gymnophthalmus*, Blyth, the Pigmy Woodpecker.—Fairly common up to 3,500 feet. Always works the branches of trees instead of the trunks like its larger allies.

22. *Chrysocolaptes stricklandi*, Layard, Layard's Woodpecker.—Fairly common from 2,000 feet upwards. I have the following note on its nidification:—Found a nest on January 12th, 1895. Bird flew out as I passed the hole, so close that I could see the whitish bill which distinguishes it from the commoner *B. ceylonus*. The hole was about 3 inches in diameter and 25 feet from the ground, drilled through the hard outer shell of the tree into the softer core, when it descended for about a foot to the egg chamber, which contained one single partially incubated egg lying on the rotten wood. Mr. C. B. Murdoch, who was with me, did the climbing, and did it right well, having to hang on for a long time while he cut out the hole with a pocket knife. The tree would have been beyond me.

There is no record of this egg being taken in "Nests and Eggs," but I conclude from the notes on the nidification of allied species that the bird only lays one egg.

I have since received another single egg of this species taken at Balangoda. Both measured $1\frac{3}{16}" \times \frac{13}{16}"$.

23. *Chrysophlegma chlorigaster*, Jerd., the Southern Yellow-naped Woodpecker.—Fairly common up to 5,000 feet. Found nest in dead stump with two young on May 2nd.

24. *Brachypternus ceylonus*, Forster, the Red Woodpecker.—Common up to 2,500 feet. Nest with two large young found, October 1st.

25. *Megalæma zeylanica*, Gmel., the Brown-headed Barbet.—Very common, but have failed to get eggs.

26. *Megalæma flavifrons*, Cad., the Yellow-fronted Barbet.—Very common. Have taken its eggs in May and June.

27. *Xantholæma rubricapilla*, Gmel., the Little Ceylon Barbet.—Very common. Procured one egg on the 6th of May, and found several nests with young in same month.

28. *Xantholæma hæmacephala*, Müll., the Crimson-breasted Barbet.—Much scarcer than the other three Barbets, and I have not noticed it above 2,500 feet.

29. *Cuculus sonnerati*, Lath., Sonnerat's Cuckoo.—Rather scarce. A male obtained on November 22nd this year had the testes much enlarged.

30. *Surniculus lugabris*, Horsf., the Drongo Cuckoo.—Was exceedingly plentiful here this year in July and August, after which it almost entirely disappeared.

31. *Coccytes jacobinus*, Bodd., the Pied-crested Cuckoo.—Rather scarce.

32. *Eudynamys honorata*, Linn., the Indian Koel.—Common at 1,000 feet.

33. *Phænicophaës pyrrhocephalus*, Forster, the Red-faced Malkoha.—Not uncommon up to 2,000 feet. Keeps in small parties and frequents heavy jungle, especially along streams. My five specimens all bore out the sexual difference which Colonel Legge notes, *i. e.*, males had brown and females white eyes. In May my bird-nesting coolie reported that he had found a nest of this bird just

commenced. As it was five miles off in jungle, I sent him again ten days later to report progress before going to examine it myself, and to my disappointment he said it was deserted. He said the nest was only just commenced when he found it—only a dozen or more thin sticks put together in a thorny bush about 10 feet high. He saw one of the birds carry a stick to it, and he knows the species well, so the little information given is probably correct. Colonel Legge does not describe the immature bird of this species, so the following rough description of a young male killed on August 6th may be of interest:—Iris, brown; bill, greyish-green; legs and feet, pale bluish-grey. Instead of the handsome scarlet face of the adult bird the young has only a small bare patch of brick-red skin round the eye, without any of the peculiar papillose growth. The feathers of the crown are edged with dull-grey instead of white as in the old bird, and the markings do not extend down the back of the neck. Tail about 2 inches shorter than in the adult, and with the white tips to central feathers only half an inch deep and tinged with fulvous; while the breadth of the central pair of feathers (across the web placed flat on the rule) is $1\frac{3}{10}$ inches against $1\frac{1}{2}$ inches in the old bird. Chin, and sides of neck and chest, greyish with black centres to the feathers. The black feathers on the throat and chest are more striated with white than in the mature specimen, and the narrow stiff feathers are confined more to the centre of the throat. Abdomen, thighs, and under-tail coverts strongly tinged with fulvous.

34. *Zanclostomus viridirostris*, Jerd., the Green-billed Malkoha.—Not uncommon, but by no means abundant.

35. *Centropus rufipennis*, Ill., the common Coucal.—Very common.

36. *Taccocua leschenaulti*, Less., the Dark-backed Sirkeer.—Fairly common up to 3,000 feet. Have seen as many as five here in a day. Always single or in pairs.

37. *Harpactes fasciatus*, Forster, the Malabar Trogon.—Sannassy, my bird-nesting coolie, who has been carefully trained and is pretty reliable, brought me three eggs on May 7th, which he said belonged to this species. He said that, noticing a likely looking hole in a stump in jungle, he threw a stone up against it, when out flew a trogon hen. The stump was quite rotten; hole about 12 feet up; the entrance was not quite large enough to admit the man's hand, and in enlarging it

he caused the stump to break off with a crash just above the eggs which were left exposed. These were frightfully hardset, live and struggling chicks in all three. The shell, however, of this egg is very thick and strong, so that by making a huge hole in each I got the chicks out, and by patching up the eggs with paper made fair specimens of them. The embryo chicks confirmed the coolie's identification, the trogon feet and broad bills being unmistakable. The eggs are perfect spheres of a very pale buff colour (exactly the tint of a bronze-wing's egg) and very glossy. They were resting on the bare wood. Dimensions $\frac{15}{16}$ " \times $\frac{15}{16}$ "

On the 9th I found another nest. Riding round the work I saw a *H. fasciatus* hen fly out of a dead stump standing in the cocoa, about 20 yards from the jungle boundary. The hole was about 18 feet up; the stump was in a state of crumbling rottenness, and would have come down with the weight of a baby. However, a strong young jak-tree sapling grew within 3 feet of the stump, and by climbing up this my horse-keeper was able to put his hand into the nest-hole. To my disappointment it contained two young ones, lying on the bare wood only an inch or two below the entrance, which was about 4 inches in diameter, round and even. On the 10th, I concealed myself in a clump of cardamoms and watched the nest with binoculars for an hour, during which time only once did a bird, the male, visit the nest with food. While feeding the young he clung to the lower edge of the hole with his tail pressed against the tree as a support; he then flew to a tree about 50 yards off, where he sat perfectly motionless with his head drawn in between his shoulders all the remaining time I watched. The hen never put in an appearance at all. The young trogons seem easily satisfied in the way of food! However, there were only two of them, and the insect brought while I watched was a rather large one—a moth I think.

I heard of another nest of this species in May only about 5 feet from the ground, but as the native who told me of it had caught the female in the hole and curried her and her two eggs, the cause of science was not much advanced in this case.

38. *Anthracoceros coronatus*, Bodd., the Crowned Hornbill.—Not uncommon at 1,000 feet elevation; in the N.-E. monsoon I have seen it up as high as 2,500 feet. It is extremely wary and hard to shoot.

39. *Tockus cingalensis*, Shaw, the Ceylonese Hornbill.—Very common and occurs up to 4,000 feet. I found a nest on August 25th, 1894. It was in a hole in a small tree (about a foot in diameter) on a patna hillside at edge of jungle. The hole was about 15 feet from the ground; the original diameter of the entrance had been about 6 inches, but it had been reduced by plastering with cement to about $2\frac{1}{2}$ inches. The hole was about 18 inches deep, and contained one large young one which I took. There was no lining of any sort to the cavity; only a few small dried up fruits and berries under the nestling. The old bird betrayed its secret by flying into the tree with a fruit in its bill, but glided off again on finding itself observed, and did not reappear while I was at the nest. The young bird only lived for a week, though it fed greedily on plantains and seemed to be doing well. A description of the nestling may be of interest:—Bill with no trace of serrations; upper mandible greenish-grey at basal half, yellow along culmen and at tip. Feet dusky greenish; eyelid dirty yellow; bare skin round orbit dark flesh-colour. Iris dark bluish-grey with an inner circle of brown. Secondaries and a few feathers on the back edged with fulvous. Plumage otherwise of same colour as in adult. The material employed in plastering up the entrance is a hard and light cement of a dark brown colour, apparently the dried ordure of the bird, as it seems to be composed of disjected seeds and pulp of fruit, with a few minute fragments of green beetle's wings in it. As far as I could see in this case the hole must have been enlarged to release the sitting hen and narrowed again to confine the nestling. Of another nest I have the following note:—April 30th, 1895. This evening saw a hornbill fly into a tall tree in jungle with something in its bill. Sannassy climbed the tree, and then saw the nest hole in the one next to it, about 50 feet from the ground. He climbed across to it by a "jungle rope" which grew between the trees, rather a dangerous performance, and after peering into the hole announced one white egg and a hornbill inside. Had to leave the nest till next morning for want of a chisel. The hole was a mere slit so that the man could not get his hand in beyond the fingers, nor was it narrowed by cement. How on earth the hen bird got in I cannot make out. As the tree was hollow for a long way down there must have been another entrance concealed by the creepers which grew thickly all up the trunk. I revisited the nest next day, and sent Sannassy up with a

light one-hand axe and hammer and chisel. The cutting into the nest took a long time, as he was unable to use the hammer and chisel having to hang on with one hand while he worked with the axe-head. At last he got his hand in and reported three eggs. The hen moved further down the cavity and disappeared. The eggs were long ovals of a dull white, much discoloured with brown and greenish stains. They were very hard set. Both birds were absolutely mute during the robbing of their nest. I since obtained two fresh eggs on May 22nd, and a single one on June 6th, this last an extraordinarily lop-sided egg, nowhere near round. It was also unusually small, measuring only $1\frac{6}{10}'' \times 1\frac{1}{4}''$. I sent the others home without noting the dimensions, but they were all much larger.*

40. *Ceryle rudis*, Linn., the Pied Kingfisher.—A female was shot and skinned for me by a Cingalese schoolmaster at Bibile, about ten miles from here, in October this year. I should think its occurrence so near the hills is very uncommon.

41. *Alcedo bengalensis*, Gmel., the Little Indian Kingfisher.—Common. Found a nest in May, but unfortunately cut into it too soon.

42. *Alcedo beavani*, Wald., Beavan's Kingfisher.—Not very uncommon, although it has been overlooked in Ceylon until quite recently. I procured two fine specimens here, both males, on a jungle stream at an elevation of 1,800 feet. They were killed on November 2nd, 1894, and April 12th, 1895; I have since seen one or two others.

The birds were kindly identified for me by Mr. J. H. Gurney of Norwich, and were exhibited by him at a meeting of the Zoological Society as the first specimens of this species obtained in Ceylon. This, however, was not the case, as I subsequently learned that it was first procured in Ceylon in 1892 in the neighbourhood of Dambool by Mr. A. P. Green of Colombo, to whom the credit of adding it to the Ceylon list is due. He informs me that he has since obtained several specimens of both sexes from various parts of the island, but all at an elevation of less than 2,000 feet.

In Ceylon Beavan's kingfisher frequents lonely forest streams and tanks, and seems shy of the vicinity of paddy-fields with their noisy cultivators and lumbering buffaloes. It is most extraordinary that this bird has been overlooked entirely in Ceylon by previous

* I have since received the measurements of three of these eggs— $1\frac{3}{8}'' \times 1\frac{3}{8}''$, $1\frac{1}{2}'' \times 1\frac{1}{4}''$, $1\frac{3}{8}'' \times 1\frac{1}{4}''$.

collectors. It can only have escaped notice by its resemblance to *Alcedo bengalensis*, causing it to be mistaken for the commoner species.

43. *Pelargopsis gural*, Pearson, the Indian Stork-billed Kingfisher.—Common ; have seen it as high as 3,500 feet.

44. *Halcyon smyrnensis*, Linn., the White-breasted Kingfisher.—Very common. Took numerous nests in May and June. Five was the largest clutch I obtained ; in several cases four and three eggs were partially incubated, while one nest contained only one young one.

45. *Ceyx tridactyla*, Pall., the Indian three-toed Kingfisher.—Occurs sparingly on lonely streams and water courses here up to 2,000 feet. During the last year I have obtained three beautiful specimens, a male and two females, and seen half a dozen others. A female killed on March 3rd, 1895, would probably have bred in May. To my mind this is the most lovely bird in Ceylon ; flitting down stream in the sunlight it is a very gem of colour. After heavy rain, when the streams it frequents are in "spate," *Ceyx tridactyla* may be occasionally met with in jungle at some distance from water.

46. *Merops philippinus*, Linn., the Blue-tailed Bee-eater.—Very common during the N.-E. monsoon, but almost entirely disappears before the hot months of June to August.

47. *Merops viridis*, Linn., the Green Bee-eater.—Common at 1,000 feet all the year round ; never seen it higher.

48. *Merops swinhoei*, Hume, the Chesnut-headed Bee-eater.—Fairly common all the year. On April 19th I noticed a single bird sitting on a tree, and guessing it to be a cock with a hen sitting somewhere near, instituted a search and found a nest hole in a red sandy bank in the tea. This I dug out with my shikar knife, and 4 feet in came upon a female *M. swinhoei*, and five beautiful fresh eggs.

49. *Chaetura gigantea*, Temm., the Brown-necked Spine-tail.—I occasionally see a few in this valley after rain, but they always fly high, and I have not procured specimens.

50. *Cypselus melba*, Linn., the Alpine Swift.—Same remarks apply.

51. *Cypselus affinis*, Gray, the Indian Swift.—Always some about after rain, but it does not breed here.

52. *Cypselus batasiensis*, Gray, the Palm Swift.—Very common. I noticed a colony of four or five pairs evidently breeding in the large

fan-shaped leaves of a single tall Palmyra palm at Madigama in April, but I had no opportunity to examine their nests.

53. *Collocalia francica*, Gmel., the Indian Swiftlet.—Very common. A small colony breed annually in a fissure of a precipice near here ; I procured some eggs from this spot on April 22nd. All the nests of this species I have seen have been at least half composed of moss, lichen, etc. Does the bird ever make a nest of saliva only ? All the nests contained two eggs or two young.

54. *Dendrochelidon coronatus*, Tickell, the Indian Crested Swift.—Common. I have the following notes on nests found :—May 1st, 1895. Riding up the steep zig-zag road to Lunugala this morning, I noticed a Tree-swift sitting across a thin dead bough of a tree below me on the hillside. When I returned in the evening it was in exactly the same position. Going closer I saw it was a hen bird. I commenced to climb the tree, and after raising itself very upright and staring at me with its crest straight on end, it flew off and commenced circling round. I climbed to a higher branch, and looking down saw the tiny nest on the side of the bough, quite filled by one long whitish egg. This was a very difficult nest to reach, the branch it was on being very thin and perfectly rotten. I sent up my horse-keeper, who is a light weight, and by holding with one hand to the bough from which I had looked into the nest and resting his feet on a mere twig, he could just touch the edge of the nest with the very tips of his fingers. I told him to come down and get a spoon from the bungalow, but the beggar said, “No, I can get it,” and in trying to get hold of the egg between the tips of his fingers he managed to push it over the edge of the tiny nest, and of course it went into fragments on the ground below, to my intense disgust. The remains showed that the egg had been beautifully fresh ; the fragments were pale grey rather than white.

The nest is a tiny shallow semi-circular bracket fixed on one side of the upper surface of the branch, and is composed of small flakes of bark and a few of the bird's own feathers, the whole glued firmly together with saliva. A rupee placed over the nest almost entirely hides it.

Having found one nest of this species I kept a keen look-out for others, and the next day spotted another ; but this was quite inaccessible. Three days later I found a third nest. The bird was sitting on it, apparently secreting saliva, and kept bending its head down to apply

it to the sides of the nest. I revisited the spot on May 11th, taking a coil of rope, saw, etc. Sannassy did his duty nobly, and after quite an hour of unsuccessful attempts managed to get hold of the egg by hanging almost head downwards by a rope tied to a bough above. The egg is a long oval, of a pale stone-grey colour. The birds kept flying round the whole time I was at the nest and seemed much excited. On the 24th I found a *fourth* nest, and with some difficulty secured the egg.

The males in this species take a share in incubation, as I several times saw them on the nests. Frequently both birds would settle close together at the side of their nest and caress each other with their bills, uttering a low chattering note. The bird always sits in the same position, *i.e.*, with its head and breast on the same side of the bough as the nest; I mean to say, with its feet on the bough where it forms the inner side of the nest, and its breast bent forward on the egg. The eggs I obtained were pale stone-grey and not "white" as described in "Nests and Eggs of Indian Birds," but they probably fade to almost white in time.

55. *Batrachostomus moniliger*, Layard, the Ceylonese Frog-mouth.—Common. During the year I have been here I have almost every night heard a peculiar nocturnal bird-note, which I always suspected must be that of the frog-mouth, but as the sound always came from heavy jungle, I could never obtain the author of it. However, at last, after many moonlight stalks, Sannassy killed me a beautiful female specimen of this bird in the act of uttering the curious call, and, the identity of the bird with its note once established, though its strictly nocturnal habits and partiality for dense jungle cause it to be very seldom obtained, I have no hesitation in describing it as common—so common that rarely a night passes without my hearing four or five different birds calling in the jungles bordering the estate. Its note is very hard to describe, but somewhat resembles the words "Coorroo! coorroo! coorroo!" uttered very rapidly in a sort of chuckle. The bird pauses for some time between each call, and does not utter its note nearly so frequently as the night-jars. I am sure this bird is not nearly so common at a high elevation as it is below 2,000 feet. I have only once heard it up-country at an elevation of 5,500 feet, and, curiously enough, in the jungle above Ragalla estate in Uda Pusselawa, the exact locality where

Mr. Edwin Watson came across one twenty years ago, as recorded by Colonel Legge.

Colouring of soft parts of my specimen (♀):—Iris, dull yellow, a very narrow circle as the black pupil is very large; bill, greenish-brown; lower mandible, paler; feet, yellow (Legge notes “fleshy grey” ?); claws, dusky brown; inside of mouth, pale yellowish-green.

Measurements:—Length, $8\frac{1}{2}\frac{7}{10}$ ”; wing, $4\frac{1}{8}$ ”; tail (from vent), $4\frac{1}{4}$ ”; bill to gape, $1\frac{3}{10}$ ”; bill across gape, $1\frac{1}{4}$ ”. The bird was killed on August 26th. The prevailing colour of this bird was a rich rufous-brown. Since writing the above, I was lucky enough to obtain on October 14th a second specimen of this curious bird. Walking round the estate after a heavy night’s rain, I noticed a draggled dead frog-mouth lying in a drain. It looked a hopeless rag, but fortunately it was still fresh, and, after washing it bodily under water for some time and then cleaning it with plaster of Paris, I was able to make a beautiful specimen of it. It was in good condition, and the stomach was full of remains of beetles. I fancy it had been killed by the deluge of rain during the night, and I was fortunate in finding it before the ants and the tropical sun had destroyed it. It was a male, a larger bird than the female mentioned above, and plumaged very differently, the general colouring reminding one something of that of the wryneck.

Length, 9”; wing, 4·6”; tail, 4·25”; bill to gape, 1·25”; across gape, 1·3”.

Iris, straw-yellow; pupil, extremely small; bill, greenish-brown; lower mandible, paler; legs and feet, brownish flesh-colour.

It is curious that in the hen-bird, shot dead in bright moonlight, the pupil was greatly dilated, while in the male, picked up dead after a pitch-dark night, it was narrowed to a mere dot.

56. *Caprimulgus kelaarti*, Blyth, Kelaart’s Nightjar.—Common. Becomes quite silent in the rains. Its note is “chooker! chooker!” and I once heard it calling in a jungle at 10 A.M. Never found a nest here, though in Uda Passelawa I once found two pairs of eggs under tea bushes within 20 yards of each other—handsome salmon-pink eggs with purplish-grey marks.

57. *Caprimulgus atripennis*, Jerd., the Jungle Nightjar.—Common. Breeds from May to August, laying its two eggs on the bare

ground near a bush, or under thin lantana scrub. I think there must have been a mistake made in the identification of the eggs sent to Mr. Hume from the Nilghiris and described ("Nests and Eggs," 2nd Ed., Vol. III, p. 47) as having a "pale creamy-pink ground faintly streaked and mottled over almost their entire surface with the palest possible reddish-brown and purple." I have taken many eggs, and they all agree exactly with Colonel Legge's description:—"Buff ground-colour very sparsely spotted with very dark sepia-brown, rather roundish blots." Six eggs average $1\frac{11}{80}'' \times \frac{67}{80}''$. Sannassy declares that he has seen *three* eggs laid by this bird occasionally. I went with him once to visit a nest which he had found with three small chicks the day before, but though the Nightjar rose from the spot when we approached, something or other had apparently taken the young as there were no signs of them.

58. *Corone macrorhynca*, Wagler, the Black Crow.—Very common.

59. *Cissa ornata*, Wagler, the Ceylonese Jay.—Fairly common; most so in the N.-E. monsoon. Keeps in small parties and sticks to heavy jungle. Feeds a good deal on tree-frogs, and is also very partial to the large *Sphinx* moth caterpillar which infests cinchona trees, to obtain which it ventures out on to estates to some distance from the jungle. A friend told me he had seen its nest in the top of a cinchona tree on Lover's Leap Estate, Newara Eliya, some years ago.

60. *Oriolus melanocephalus*, Linn., the Black-headed Oriole.—Common. Took a clutch of three fresh eggs on May 20th.

61. *Graucalus macii*, Less., the Large Indian Cuckoo-shrike.—Shot a male on September 25th this year.

62. *Pericrocotus flammeus*, Gray, the Orange Minivet.—Common. I found one nest in December, but it was inaccessible. Called "Flame-bird" in Ceylon.

63. *Pericrocotus peregrinus*, Linn., the Little Minivet.—Common. Its beautiful little nest has been often described before, so I only give the dates on which I procured eggs this year—April 4th, and May 12th, two eggs in each nest.

64. *Lalage sykesi*, Strickl., the Black-headed Cuckoo Shrike.—Fairly common. Took a clutch of two eggs on May 5th, and a single egg on May 26th, and found one or two nests with two young about same date.

65. *Tephrodornis pondicerianus*, Gmel., the Common Wood-shrike.—Fairly common. Took a pair of fresh eggs on May 10th, and found a few nests with young later.

66. *Hemipus picatus*, Blyth, the Little Pied Shrike.—Common ; but, though I tried hard, I failed to get eggs. On May 12th, after watching one for some time, I found its nest, a tiny shallow cup covered exteriorly with cobweb, placed on a small dead lichen-covered bough 20 feet from the ground. It contained to my disappointment three very small young, though the bird, on going to the nest, sat on it for some time before I went up, leading me to expect eggs. A very difficult nest to "spot."

67. *Lanius cristatus*, Linn., the Brown Shrike.—Common in N.-E. monsoon.

68. *Buchanga leucopygialis*, Blyth, the Ceylonese White-bellied Drongo.—Very common ; took a few nests in March, April and May. The eggs—it lays two or three—vary greatly. Some are flesh-coloured with marks of pale grey and pale reddish-brown ; others white with a few large blotches of a deep rusty-red. The nest is placed in a horizontal fork of a bough. The nest described by Colonel Legge as $2\frac{1}{2}$ " in diameter must have been an unusually small one, or else the figure has been misprinted.

69. *Dissemurus paradiseus*, Linn., the Racket-tailed Drongo.—Fairly common about 2,000 feet and downwards.

I have the following notes of nests :—

April 11th.—Started at six this morning to visit the racket-tailed drongo's nest which Sannassy found yesterday. Passed through the village to get a boy to do the climbing ; selected a little fellow who could not have weighed more than 30 lbs. * * * Proceeded up stream for about $1\frac{1}{2}$ miles, wading ; bed of river was about 15 yards broad, a mass of large boulders of rocks, between which the water ran fast and strong. On each side was tall forest, from which came the scale-like call of the spur-fowl and the metallic crow of the jungle-cock ; it was beautifully cool at that hour, and, had it not been for the myriads of leeches which infested the river banks, the morning would have been most enjoyable. As it was, I was soon bleeding from head to foot from scores of irritating punctures. Presently we arrived at the nest. A single sapling grew from a small island of rocks at the

water's edge ; it was about 30 feet high and 3 or 4 inches in diameter at base ; where the nest was, about 20 feet up, it was barely an inch thick. The nest was built in a horizontal fork about 2 feet to the side of the main stem. I sat down on a rock and sent up the boy. At this stage of the proceedings the drongo put in an appearance, scolding angrily. I could easily have shot her, but it was not necessary. The boy got within 4 feet of the nest, and then got frightened at the bending of the tree. However, after a little persuasion and exhibition of some small change, he went on again, and reaching the nest announced "gittera" (eggs). He then brought down in his hand a beauty and went up again, but this time the sapling bent like a fishing rod, and his awkward position caused him to crack one of the two remaining eggs. However, it made a pretty fair specimen. The ground-colour of the eggs was pink, and the markings were lilac-grey and reddish. The nest, which I have before me, is a broad shallow saucer ; foundation of small twigs and roots ; lining of finer roots and vegetable fibre of sorts. There are a few pieces of moss, lichen, and cobweb on the outside. External diameter about 6 inches. The nest was suspended in a fork, and had a long stay of roots and fibres running up the bough for about 10 inches from the inner angle of the fork.

Another nest found on April 20th contained three young.

On the 5th of May the bird whose nest I took as described above had built again in the same tree, and the nest contained one fresh egg. I left it, and revisiting the spot two days later to my disgust found the nest empty. Usual luck. I would have thought the drongo could have kept off lizards and squirrels, the principal egg destroyers, and I do not see what else could have taken the egg, placed as the nest was.

70. *Terpsiphone paradisi*, Linn., the Paradise Flycatcher.—Fairly common at 1,000 feet, immature birds far outnumbering the white males, which I have only noticed in the N.-E. monsoon. This species ranges far higher into the hills than 2,000 feet, above which Colonel Legge did not notice it. I have seen young red birds frequently in the N.-E. monsoon as high as 5,500 feet in Uda Pusselawa and Dimbulla, and Mr. E. V. Carey once told me he had seen a long-tailed white bird at 6,000 feet.

71. *Hypothymis ceylonensis*, Sharpe, the Azure Flycatcher.—Common up to 2,500 feet. Builds a lovely little nest in a fork of a

bush or hanging rope-like creeper, composed of green moss, fibres, tendrils, etc., and decorated with cobweb, small white cocoons and such like. Eggs two to three, fleshy-white with small reddish spots at large end. Seen in the shade in jungle this bird appears a dull greyish-blue and does not look nearly so pretty as it really is, till in a sally on a passing insect it flutters out into a ray of sunshine, when it becomes the "Azure" Flycatcher all over.

72. *Culicicapa ceylonensis*, Sharpe, the Grey-headed Flycatcher.—Common at 4,000 feet, but gets scarce lower down. The nests are little moss watch-pockets, built against a tree or face of a rock. I took one on May 6th with two fresh eggs; though the nest had only been looked at twice and not touched, it was apparently forsaken. I have only known a few nests, but the bird seems to me a shy breeder, deserting readily, although it is otherwise the very tamest of birds. I once watched a pair frequenting a nest quite 50 feet from the ground on the trunk of a huge tree; all the other nests I have seen have been from 10 to 20 feet high.

73. *Rhipidura albifrontata*, Frankl., the White-fronted Fantail.—Common. Breeds from March to May. Nearly always builds a second nest quite close if the first is taken. I watched one pair this year build their pretty little nest, and then, as Mrs. Fantail's expectations were not fulfilled quite as soon as she had anticipated, they occupied the interval in building a second nest on the next tree, which was ready just in time for the event; the first nest was left unused.

I have always found two or three eggs. The nest is a beautiful little cup placed on a single thin branch, made of fine grass and wound round and round outside with cobwebs until it appears quite greyish-white. The birds relieve each other on the nest, as a fantail cannot keep still for long under any circumstances. It is a plucky little bird, and fearlessly attacks any larger species passing too close to its nest. I have seen it go for that black marauder, the Malay eagle, in the most determined way.

There can hardly be a prettier sight than to see this bird fearlessly settling on the head of an old bull buffalo—now balancing itself on the big hairy ear and flirting its tail, till a sudden flap of the ear sends it fluttering up into the air to resettle on one of the horns; now hovering round the great grim face, snapping up an insect here and there, and

occasionally capturing a tiny eye-fly with such a vigorous peck in the great brute's eye as to cause it to shake its head disapprovingly, and send the fantail off in a hurry to the nearest tree ; whence, however, after fidgiting about for a few seconds, it generally drops down again to resume its search for parasites on the buffalo's back and head.

74. *Alseonax latirostris*, Raff., the Brown Flycatcher.—Occurs sparingly in N.-E. monsoon. Habits very like those of the English spotted flycatcher. I have generally found it solitary, but have once or twice noticed it among the gathering of birds that takes place when a flight of winged termites are issuing from their nest hole. Luckless termites ! What with crows, swifts, drongos, brown shrikes, common and green bulbuls, sun-birds, and munias all on the look out, their first flight into open air is generally short ! *Lanius cristatus*, not being a sportsman, stands at the mouth of the hole and nails them as they walk out ; but all the others take them flying, even the little munias (*punctulata*).

75. *Alseonax mattui*, Sharpe, the Rusty Flycatcher.—I obtained a male on November 7th this year. I think I have once or twice seen it before, but am doubtful about it ; the birds might have been only *A. latirostris*.

76. *Stoparola sordida*, Wald., the Ceylonese Blue Flycatcher.—Common, most so at about 4,000 feet. Nests in banks, crevices in trees, etc., from March to May. The nest and eggs are very like an English robin's. I have never found more than two eggs. This flycatcher is very partial to mulberries.

77. *Siphia tickelli*, Sharpe, the Blue Redbreast.—Common. Breeds from April to June. Builds a nest like a robin's in banks or trees at a height of from 2 to 15 feet. Lays generally three, but sometimes only two eggs, of an olive colour, *very* faintly and finely mottled with rufous. I killed the hen-bird of the first nest I found for identification ; the cock at once found another mate, and a second nest was built in the same bank within eight yards of the first one, but the taking of this seemed to shake the birds' faith in the locality and they went elsewhere.

78. *Muscicapa hyperythra*, Cabinis, Nietner's Robin Flycatcher.—Fairly common in N.-E. monsoon, but keeps to a high elevation.

79. *Copsychus saularis*, Linn., the Magpie Robin.—Very common. Breeds from April to July.

80. *Cittocincla macrura*, Gmel., the Long-tailed Robin.—The shama is fairly common here, inhabiting the jungles and wooded dells on the patnas to 3,000 ft. or more. It is a shy bird, and not very easy to shoot if you walk after it, but if you stand still and imitate (however feebly) a few of its trilling notes, a cock-bird will come fluttering through the cover and settle quite close to you. To my mind this is an unrivalled songster. I found a pair building a nest in a hole in a tree in jungle this July, but just as it was ready for eggs a deluge of rain flooded the hole; and with me shama's eggs are still *desiderata*. Nest was about 40 feet from the ground and similar to magpie robin's.

81. *Thamnobia fulicata*, Linn., the Black Robin.—Common. Breeds from April to September.

82. *Larvivora brunnea*, Hodgson, the Indian Woodchat.—Killed a male here on November 11th. It is certainly scarce in this part of the Province; as Colonel Legge says, "In the eastern parts of Uva it is not common, the great expanse of patnas below the plateau and the deep valley of Badulla probably proving a barrier to its progress."

83. *Turdus spiloptera*, Blyth, the Spotted Thrush.—Fairly common, but is a shy bird and sticks to jungle. I have taken nests in April, October, and November, so it breeds twice a year, just before and just after the hot season. A shy bird when breeding, and slips off the nest before you are near it. Lays three eggs.

84. *Hypsipetes ganeesa*, Sykes, the Black Bulbul.—Very common. At some times of the year the jungles simply ring with its noisy notes. It lays two eggs only, pinkish-white with claret-coloured and grey spots. May was the only month I found nests. They were from 15 to 25 feet from the ground and pretty well concealed.

85. *Criniger ictericus*, Strickl., the Forest Bulbul.—Fairly common. Breeds in April and May. I found a few nests, but was unfortunate in their containing either young or very hardset eggs. It lays two. I procured three specimens only.

86. *Iaos luteolus*, Less., the White-eyebrowed Bulbul.—Very common. Breeds in May in the lantana bushes and lays two eggs. I have examined a lot of nests, and never saw more than two eggs or young. The majority of eggs are exactly like common bulbul's eggs, only more stumpy. I italicize the *are*, as Mr. Hume in "Nests and Eggs," 2nd Ed., Vol. I, p. 190, says they are excessively *unlike*. It

lays two types of eggs, and the *scarcer* one here is what Mr. Hume describes as being "marked with the colour one would get by mixing brown with vermilion." Only one pair out of several answered this description, and there was no doubt as to the identification of all my specimens. But I see Mr. Hume had only two eggs before him when he wrote.

87. *Rubigula melanicter*a, Gmel., the Black-headed Bulbul.—Common, but I have failed to find a nest. I shot a hen with a largely developed egg in her in August.

88. *Kelaartia penicillata*, Blyth, the Yellow-eared Bulbul.—I can find no note on this bird's breeding in Legge or "Nests and Eggs." I have found its nest in Dimbulla in April—a large cup of moss and elephant-grass leaves. It contained one fresh egg when I found it, but when I visited it again next day it did not ! And I was unlucky in clumsily breaking an egg sent me from Balangoda this year. The egg is a broad oval, and (I write from memory) of a pinkish ground-colour, marked with rather blurred blotches and streaks of pinky brown. I do not see the bird much below 4,000 feet.

89. *Pycnonotus hæmorrhous*, Gmel., the Madras Bulbul.—Extremely common.

90. *Phyllornis jerdoni*, Blyth, the Green Bulbul.—Very common, but never found nest.

91. *Phyllornis malabaricus*, Blyth, the Malabar Green Bulbul.—Same applies.

92. *Iora tiphia*, Linn., the Common Bush Bulbul.—Fairly common. Had a pair of eggs sent me this year from Balangoda, but I have never seen a nest myself.

93. *Malacocercus striatus*, Swains.—Fairly numerous ; but I have never seen its nest.

94. *Pomatorhinus melanurus*, Blyth, the Ceylonese Scimitar Babbler.—Common. Makes a domed nest of grass in a bank, something like a large willow-wren's. I took a clutch of three fresh eggs on January 1st, and another of three eggs too hard set to blow in March. Another clutch of three was sent me from Balangoda in May. The eggs are pure white and very glossy.

95. *Dumetia albugularis*, Blyth, the White-throated Wren Warbler.—Common. Have found a few nests between May and September.

All had three eggs. I was deprived of one clutch in a rather peculiar way. I found a nest building, almost on the ground, in long grass. I visited it eight days later and found it replaced by a fresh white ant hill. Kicking it open, I found the ants had used the globular mass of grass as a foundation and imbedded the ill-fated nest in a cone of earth 2 feet high.

96. *Alcippe nigrifrons*, Blyth, the Ceylon Wren Babbler.—Breeds in the rainy season and up to May. It makes three or four nests before it lays in one, so that they are very common in jungle, though almost always empty. Lays two eggs.

97. *Pellorneum fuscicapillum*, Blyth, the Whistling Quaker Thrush.—Very common, but a fearful little skulk and not easy to shoot, as it flutters off through the dense jungle underwood directly it is approached. Colonel Legge recognized it as a common bird by the frequency with which he heard its whistle, which he describes exactly by the words "to meet you," and I believe it is even more numerous than an acquaintance with its whistle would lead one to believe, as, though sometimes it whistles incessantly, I have several times seen three or four pairs in a day without hearing its note once. A male shot on April 4th was in a state of breeding. This bird when shot was clinging to a perpendicular rock like a *Pomatorhinus*.

98. *Pyctorhis nasalis*, Legge, the Black-billed Babbler.—Common. Breeds in May. Builds a cup-shaped nest between stems of maana grass. Lays three eggs, short and broad in shape, white with large blotches of sienna-brown.

99. *Orthotomus sutorius*, Forster, the Indian Tailor-bird.—Common. I have seen its nest in a single leaf of a kind of vegetable-marrow, between two leaves of a large-leaved jat of tea plant, between two coffee leaves, and between quite a dozen leaves of cinchona—the broad-leaved *succirubra* variety, in which case the leaves were about four-deep all round the nest. This was at 5,500 feet in the wet weather, so I suppose the object was shelter against rain and wind.

100. *Prinia socialis*, Legge, the Ashy Wren Warbler.—Very common. Breeds here from January to June. Although Colonel Legge says that "nothing can be more un-tailor-bird-like than the nest which it builds in Ceylon," and proceeds to describe the nest as "a shapeless ball of guinea-grass roots thrown as it were between the

upright stalks of the plant," I think the type he describes is quite the exception and not the rule. I have seen *dozens* of nests of this bird, and one only answered exactly to Colonel Legge's description, while *all* the others were of the tailor-bird style. It lays almost always three eggs; I have found two hard set; have never seen four in a nest.

101. *Prinia hodgsoni*, Blyth, Hodgson's Wren Warbler.—Fairly common. Have not procured eggs. Breeds about May, as I have seen broods of young in July and August.

102. *Drymæca valida*, Blyth, the Robust Wren Warbler.—Fairly common. Found four nests building in May, but they were all destroyed by patna fires before the birds laid. It builds a domed nest in maana grass near the roots.

103. *Drymæca insularis*, Legge, the White-browed Wren Warbler.—Very common. Have found numbers of nests, mostly in May, but I have seen odd nests all through the year.

104. *Cisticola cursitans*, Blyth, the Common Grass Warbler.—Common in short grass or paddy fields, but seems to leave the tall rank-smelling maana grass to *Prinias* and *Drymæcas*. Have found one nest.

105. *Phylloscopus nitidus*, Blyth, the Green Tree Warbler.—Common in N.-E. monsoon.

106. *Parus atriceps*, Horsf., the Grey-backed Titmouse.—Common, but much more so above 2,000 feet than below it. Have found nests with young in April and May, but have not got its eggs.

107. *Dendrophila frontalis*, Horsf., the Blue Nuthatch.—Common. In May I saw a pair carrying feathers into a small round hole (probably a little barbet's) in a tall dead stump which was too rotten to climb. The hole was about a foot below the top of the stump, and the Nuthatches always settled on the top and crept downwards into the nest exactly as described by Miss Cockburn in "Nests and Eggs."

108. *Cinnyris lotenius*, Linn., Loten's Sun-bird.—Common. Breeds from April to June. It is extremely fond of building its nest into the deserted web of a species of caterpillar which is common here, and these nests are very hard to detect. It also builds a hanging nest of the usual sun-bird type. One had a train of flakes of bark, some 2 inches long, attached to each other by spider's web, hanging for 14 inches below it. It lays two eggs very little larger than those of *C. zeylonicus*; perhaps, as a rule, of a longer shape and a grayer tint.

109. *Cinnyris zeylonicus*, Linn., the Ceylonese Sun-bird.—Common. Have taken plenty of nests in earlier part of year. I have never seen one built in a caterpillar's web, as *C. lotenius* is so fond of doing.

110. *Dicæum minimum*, Tick., Tickell's Flower-pecker.—Common. Have taken a few of its lovely little pendant pear-shaped nests in April and May. They contained two white eggs, large for the size of the bird, being as large as small eggs of *Munia striata*.

111. *Piprisoma agile*, Blyth, the Thick-billed Flower-pecker.—Not uncommon I think, but as it frequents tall trees in jungle, it is hard to distinguish it for certain from immature sun-birds. I have killed five specimens here.

112. *Zosterops palpebrosa*, Blyth, the Common White-eye.—Very common. Breeds in early part of the year.

113. *Zosterops ceylonensis*, Holdsw., the Ceylonese White-eye.—Common at 4,000 feet and over. Nest and eggs very similar to the common white-eye's. It is fond of building in the *grevillea* trees which are so extensively planted on Ceylon tea estates as belts to break the force of the wind. Coffee trees, too, are often chosen. This species is easily distinguished at a distance from the previous one, as the latter has a yellowish tint in its plumage, which our "peculiar" bird quite lacks. It is also much tamer than *Z. palpebrosa*. I have twice caught it in a butterfly net.

114. *Hirundo rustica*, Linn., the Common Swallow.—Common in N.-E. monsoon.

115. *Hirundo hyperythra*, Layard, the Ceylon Swallow.—Very common, but I have not procured eggs. It builds a good deal under culverts on the roads, and also, I believe, in rocky caves in the hills. A pair built under my bungalow this July. The nest was only two feet from the ground, and was a large martin-like structure which they took a month putting together. My cat, however, took such an absorbing interest in them that they eventually forsook it.

116. *Hirundo javanica*, Sparrm., the Bungalow Swallow.—Common. Keeps more to the neighbourhood of houses and factories than the last species, and is very tame, building fearlessly in rooms in daily use.

117. *Passer domesticus*, Linn., the House Sparrow.—Very common of course and just the same cheeky bird in the native bazaars of

Ceylon as in the streets of London. Curiously enough some bungalows never have a sparrow near them—why, I cannot say.

118. *Motacilla melanope*, Pall., the Grey Wagtail.—Common in the N.-E. monsoon.

119. *Budytes viridis*, Blyth, the Grey-headed Wagtail.—Have occasionally seen flocks in the paddy fields at 1,000 feet.

120. *Corydalla rufula*, Kelaart, the Common Pipit.—Common. Breeds from May till September.

121. *Mirafra affinis*, Jerdon, the Madras Bush-lark.—Fairly common at 1,000 feet.

122. *Ploceus philippinus*, Linn., the Common Weaver-bird.—Not uncommon at 1,000 feet and under. Twelve miles further down the Batticaloa cart-road it is common.

123. *Munia kelaarti*, Blyth, the Hill Munia.—Common over 4,000 feet. Breeds in trees at a good height.

124. *Munia punctulata*, Hume, the Spotted Munia.—Common. Breeds in trees all round the bungalow.

125. *Munia striata*, Blyth, the White-backed Munia.—Common. Breeds in the cocoa trees and in long grass. One has got a nest at the present moment in the hole in a stump in which I found a trogon's nest with young, previously alluded to. Is not this a most unusual site for it to select?

126. *Artamus fuscus*, Vieill., the Ashy Wood Swallow.—Common at 1,000 feet, becoming less so up to 3,000 feet, above which I have not noticed it.

127. *Acridotheres melanosternus*, Legge, the Ceylonese Myna.—Very common. Breeds of course in holes of trees; they make capital pets.

128. *Eulabes religiosa*, Jerdon, the Southern Myna.—Very common. Have not obtained eggs. I have not seen *E. ptilogenys* in this district, though I have procured it elsewhere in similar localities.

129. *Pitta coronata*, Hume, the Indian Pitta.—Common at all elevations in N.-E. monsoon. It is curious that it is much more noisy in the low country than in the hills. In Uda Pusselawa I have flushed several in a day, but seldom heard its call. Here at 2,000 feet the peculiar double whistle sounds on all sides at sundown. The *Pitta* frequents the same spot week after week, and is easily caught

under a sieve-trap set near a manure heap to which it resorts ; a fat white coffee-grub proves an irresistible bait. I once kept three in an aviary for some time, but they all died when the time for migration arrived. They got very tame, hopping up to me and taking worms and coffee grubs from my fingers without fear. They seemed rather quarrelsome birds, frequently ruffling up to each other like game-cocks with half-spread wings, thus showing off the brilliant blue shoulder patches.

130. *Palumbus torringtoniae*, Kel., Lady Torrington's Pigeon.—Not uncommon at any time, but only at all numerous about September and October. Its note is far more like the hoot of an owl than the "coo" of a wood pigeon—a deep guttural "hoom" repeated at intervals. I have one egg, taken by my brother, Mr. C. E. Butler, in Uda Pusselawa on November 11th, 1894. He described the nest as placed in a small tree in jungle about 25 feet from the ground. The egg is similar to, but smaller than, an English wood pigeon's, $1\frac{3}{8}'' \times 1\frac{1}{8}''$. At the present minute I know of a nest being built near here (September 24th). I believe it only lays one egg, as the one my brother took was hard set, and Mr. Bligh mentions frightening a single young one from a nest ; but natives tell me it lays two eggs.

131. *Turtur suratensis*, Blyth, the Spotted Dove.—The common dove here ; very numerous ; breeds in early part of the year.

132. *Chalcophaps indica*, Linn., the Bronze-winged Dove.—Common. I have found its nests in April, July, August, September and October. I think it breeds all the year round. The nests are from 4 to 10 feet from the ground ; the two eggs are pale buff colour, and vary greatly in size. This lovely dove seems to take a pleasure in dashing with lightning speed through the open windows of bungalows and through verandahs. I have more than once known one to fly through my tea-factory when work was going on, entering the door and escaping at the windows on the other side in an instant. What on earth could be the reason of its flying straight at a large building standing right in the open and echoing with the rattle and clank of machinery I do not know. I do not think it can be attracted by the reflection of trees in the windows, as I have never seen it strike a pane.

133. *Carpophaga ænea*, Gray, the Imperial Green Pigeon.—Fairly common occasionally at 1,000 feet.

134. *Osmotreron bicincta*, Jerdon, the Orange-breasted Green Pigeon.—Resident at 1,000 feet. A male killed from a flock on March 3rd was in a state of breeding. In September and October the birds ascend to 2,000 feet or so when certain jungle-trees are fruiting, but I do not think they range higher.

135. *Osmotreron pompadoura*, Gmel., the Pompadour Green Pigeon.—Resident all the year round; most common in the N.-E. monsoon. Ranges up to 3,000 feet at that season. I found a nest building in June, but the bird never laid.

136. *Gallus lafayetti*, Less., the Ceylon Jungle Fowl.—Common. Breeds chiefly in May and June; at any rate the crow of the old cock is most frequently heard then. The clutches I have taken have always been three to four eggs. The average of eleven now before me is $1\frac{1}{2}\frac{7}{10}'' \times 1\frac{2}{3}''$; the largest measures $2'' \times 1\frac{7}{10}''$; the smallest $1\frac{7}{10}'' \times 1\frac{7}{10}''$. The eggs are generally covered all over with small brown specks, but I have one without any of these, looking exactly like a village hen's egg.

I may mention that on April 21st I found a nest of this bird containing three extremely small abortive eggs without any yolk. They were devoid of spots and had a very rough surface.

Of the stupefying effect which the "nilho" seed is supposed to have on these birds I have had no experience; but I have twice seen apparently healthy old cocks skulk under a bush and allow themselves to be caught by hand. Whether this was due to intoxication caused by eating "nilho" seeds I cannot say. I should think that Mr. Holdsworth's suggestion that the bird occasionally eats some noxious fungus growing in the same jungles as the "nilho" is probably right.

If the "nilho" seed has any narcotic qualities, it seems strange that it should not affect the bronze-winged doves, which also feed on it greedily, crowding up-country in years when the plant is seeding until the jungles resound with their lowing note.

Colonel Legge says the adult male has the "legs and feet wax yellow;" I have occasionally shot an old cock with the legs of a dark reddish flesh-colour.

137. *Galloperdix bicalcarata*, Forster, the Ceylon Spur-fowl.—Common, but very shy and almost impossible to shoot without a dog. I find from my notes that I have taken eggs in every month from

March to September. Seven eggs measured average $1\frac{1}{2}\frac{3}{0}'' \times 1\frac{1}{5}''$, and vary considerably from $1\frac{1}{3}''$ to $1\frac{1}{2}\frac{7}{0}''$ in length, by $1\frac{1}{8}''$ to $1\frac{1}{4}''$ in breadth. Most eggs are covered with a profusion of small chalky white specks, but in some these are almost entirely absent. Personally I have not found more than two eggs in a nest, though I have once seen three chicks with a hen. The nests are mere scratchings in the ground in jungle, with only a leaf or two for lining.

138. *Francolinus pictus*, Blyth, the Painted Partridge.—Scarce, and is, in this neighbourhood, unfortunately getting scarcer. The reason is probably partly due to the damage done to its nests and young by the periodical patna fires which I have mentioned, and partly owing to the cock-bird's fatal habit of crowing from the top of a rock or ant-hill. Unfortunately powder and shot are now so cheap that the native no longer restricts himself to deer and pig as formerly, and when once the francolin has given himself away by crowing, the stealthy-footed native gunner finds it easy to stalk him. However, in another part of the province I knew of $4\frac{1}{2}$ brace being bagged by two guns last season in a morning's shooting over dogs.

139. *Perdica asiatica*, Gould, the Jungle Bush-quail.—Common up to 3,000 feet. A bevy when flushed scatter in all directions, but if you remain quiet after a minute you hear their peculiar ventriloquistic "tirri-tirri-tirri" sounding from all sides; presently it ceases, and if you beat about, up get the whole bevy again as if they had never been dispersed. I have failed to get a nest, but I have seen a hen with a large brood of tiny cheeping chicks in June.

140. *Coturnix chinensis*, Blyth, the Blue-breasted Quail.—Common in suitable, *i. e.*, damp, localities. Not at all a bird of the dry patnas like *T. taigoor* and *P. asiatica*. It breeds in the rank grass growing at the edges of paddy fields, and on the bunds which separate the terraces. I have taken nests in March, April, and May. The largest clutch was *nine*, taken on March 13th; but as two eggs seem rather larger and less speckled than the others, the nest was probably a joint stock concern. The next largest clutch of eggs taken numbered seven. The eggs are olive-brown, finely speckled all over with reddish-brown spots.

141. *Turnix taigoor*, Sykes, the Black-breasted Bustard-quail.—Very common. Have taken nests all the year round; males take part in incubation. Four eggs is the most I have come across in one nest.

142. *Porzana fusca*, Linn., Blyth, the Ruddy Rail.—Have seen it here in the N.-E. monsoon. Could the unidentified rail's eggs noted in the remarks on *H. striata* belong to this bird? The measurements agree well with those Mr. Hume gives for the eggs of this species, and are small for those of *H. striata*.

143. *Hypotaenidia striata*, Linn., the Blue-breasted Rail.—Common in suitable spots, but a terrible skulk. Though it has been previously recorded as only a migrant to Ceylon, it is my firm belief that numbers remain and breed in the island, and that three eggs in my possession are those of this bird. They were brought to me at Fort Macdonald in May, 1893, by a native who declared them to belong to this species. The eggs are exact miniatures of those of *E. phaenicura*. This year, on July 1st, two more similar eggs were brought me taken here. They were too cracked to preserve, and contained large rail chicks, covered with black down. What else could they be but *H. striata*? On August 20th this year I watched a pair of these rails feeding in a ditch for some time, and in addition to this, intelligent natives have told me that they often come across its eggs when reaping the paddy. It might very easily escape notice in the breeding season when the paddy is high, especially as sportsmen hardly ever go near the paddy fields after the departure of the snipe. Two of the eggs I refer to measure $1\frac{1}{4}'' \times \frac{7}{8}''$ and $1\frac{1}{8}'' \times \frac{13}{16}''$.

144. *Erythra phaenicura*, Penn., the White-breasted Water Hen.—Common; but have only obtained two eggs.

145. *Gallinago cinerea*, Gmel., the Water Cock.—Rather scarce. I have met with it a few times at 1,000 feet in N.-E. monsoon, but it is most likely resident all the year.

146. *Rhynchæa capensis*, Linn., the Painted Snipe.—Rather scarce in this part of the province. I have never found a nest, though a pair killed on January 5th this year were obviously breeding.

147. *Gallinago stenura*, Blyth, the Pin-tailed Snipe.—Very common in N.-E. monsoon. The first shot in Ceylon this year was killed on August 31st.

148. *Totanus glareola*, Temm., the Wood Sand-piper.—Very common in N.-E. monsoon.

149. *Totanus ochropus*, Temm., the Green Sand-piper.—Fairly common in N.-E. monsoon.

150. *Tringoides hypoleucus*, Linn., the Common Sand-piper.—Occurs sparingly in N.-E. monsoon. Sticks to streams and rivers in preference to paddy-fields.

151. *Tringa subminuta*, Midd., the Long-toed Stint.—At 1,000 feet a few may generally be seen among the large flocks of Wood sand-pipers which frequent the newly-ploughed paddy fields. I have shot this Stint at Fort Macdonald at an elevation of 3,500 feet.

152. *Charadrius falkus*, Gmel., the Asiatic Golden Plover.—Small parties about the lower-lying paddy fields this December and January, though I did not observe any last year.

153. *Lobivanellus indicus*, Bodd., the Red-wattled Lapwing.—Always a few in the paddy fields at 1,000 feet in N.-E. monsoon.

154. *Sterna anglica*, Montagu, the Gull-billed Tern.—Occasionally ascends to 1,000 feet in large numbers in very wet monsoon weather, feeding on crabs, etc., in the newly ploughed paddy fields.

155. *Dendrocygna javanica*, Holdsw., the Indian Whistling Teal.—Saw a single bird flying round and round a large inundated paddy-field at Madigama this January, the first I have seen here.

156. *Dissura episcopa*, Bodd., Holdsw., the White-necked Stork.—Occurs occasionally in N.-E. monsoon in paddy fields up to 1,000 feet.

157. *Bubulcus coromandus*, Hume, the Cattle Egret.—Very common at 1,000 feet to 2,500 feet. I do not think it breeds near here.

158. *Ardeola grayi*, Holdsw., the Pond Heron.—Same applies.

159. *Ardeiralla cinnamomea*, Gmel., the Chestnut Bittern.—Common; breeds in May, as a female shot then was evidently laying.

160. *Gorsachius melanolophus*, Raffl., the Malay Bittern.—Since these few notes had the honour of being read before the Society, I have procured a beautiful specimen of this scarce Bittern, a male, killed near Bibile some ten miles from here this January. Colonel Legge enumerates nine instances of its occurrence in Ceylon between 1852 and 1877.

This concludes the list of species I have been able to identify during the year. I have also met with a small brownish warbler once or twice in short grass at 2,000 feet or so, which is new to me. It rises at your boots, flutters jerkily for fifteen yards, and then drops like a stone into the grass, and nothing on earth will induce it to show again. It has a broadish tail, and is, I think, brown below as well as above. There is no bird on the Ceylon list which this could be, except *Locustella erthiola* or *Schœnicola platyura*; but *S. platyura* was added to the Ceylon list on the strength of a single skin, history unknown, in the British Museum, labeled "Ceylon: ex Cuming," and no ornithologist in the island has met with it since. I must endeavour to procure a specimen of my bird. The only information I can find on the habits of *S. platyura* applies well to it, though the chances are against its being such a rarity. Whatever it may be, it is from its extraordinarily skulking habits just the bird to be overlooked.

I have also a note of a shrike seen at 1,000 feet in October, but not procured:—"Body greyish, head quite grey with conspicuous black eye stripe; certainly not *L. cristatus*, but about the same size. A pukka *Lanius* of sorts." Would this be *L. lucionensis*, with which I am not familiar?

I have once or twice seen a fine eagle on the wing which I take to be *Spizæetus kelaarti*.

Hydrophasianus chirurgus, I am told, straggles up to 1,000 feet here occasionally, but I have not seen anything of it myself.

REVIEW.

The book before us is a penultimate instalment of the Secretary of State's "Fauna" of India (Birds).*

The first order and family noticed are the broad-bills, which do not occur in the Bombay Province. Then come the woodpeckers, of which we have several, here duly described. One Maratha name for them here given is "Lohar" (smith), which is not as common as the more appropriate "Tokera" (hammerer or pounder), and "Sutar" (carpenter). The latter is given (p. 160) as a name of the Hoopoes. Their commoner and better name is "Sonar" (goldsmith). It distinguishes their light and silent picking action as resembling that of the trade, with its toy-tools falling on precious metals; commonly almost backed by silent compost.

If the "roll" were not almost unknown to Indian drummers, the woodpeckers would probably have a name from that trade too, as it is one of their favourite bits of music, and not used by any other winged carpenter.

Their relations, the wrynecks, are not found in Bombay, nor is the Indian honey-guide (*indicator*), which has not yet shown anybody any honey.

After these come the barbets. Mr. Blanford restricts the generic name *Megalæma* to species outside our bounds, but allows us two species of *Thereiceryx*, apparently a new name of his own. *Thereiceryx zeylonicus* is now the full style and title of the common Indian green barbet, and we are well rid of *inornata*, unnecessarily distinguished as a species of "the Bombay coast."

The coppersmiths remain *Xantholæma*, but *X. indica* becomes *Hæmatocephala*, an older name and more descriptive. Nothing is added to our knowledge of it.

At this point we come to the order *Anisodactyli*, about whom there has been much difference and discussion, such as would be out of place here. The first of them are the rollers (*Coracias*), commonly called jays from their blue colouring and noisy bustling habits; but if any one will look at a European jay's wing, the different arrange-

* The "Fauna" of British India, including Ceylon and Burma, published under the authority of the Secretary of State for India in Council, edited by W. T. Blanford. Birds, vol. III, by W. T. Blanford, F.R.S. London: Taylor and Francis. Bombay: Thacker & Co., &c., &c.

ment of its blue surface is easy enough to note. We have the common Indian roller or *Tas*, and occasionally in the cold weather the European roller visits our northern districts, especially Sind. Mr. Blanford only admits lizards to the Indian roller's dinner-table with a "perhaps," but we have seen it eat both lizards and small snakes.

The bee-eaters come next, with no noticeable remark and no serious alteration of nomenclature.

Different is the case of the kingfishers. The pied kingfisher is now finally separated from *Ceryle rudis* as *C. varia*, and contrarywise the little blue kingfisher is united to the European species *Alcedo ispida* for good. The name *bengalensis* is well out of the way and *sindiana* can scarcely be said to have ever been in it. Mr. Blanford gives *Khandu*, *Khandya*, as Maratha names; but in the Konkan the true name is *Dis*. Our great kingfisher, *Pelargopsis gaurial*, keeps its place; so does our middle-sized blue kingfisher, *Halcyon smyrnensis*, with the just remark that it is not much of a fisher, living "chiefly on insects and small lizards, and sometimes on mice and land crabs;" the last three pretty strong diet for so small a bird. The next set of birds are the hornbills.

"Fleas are not lobsters," said Sir Joseph Banks (as reported, we think, by Peter Pindar); and "hornbills are not toucans,"* says Mr. Blanford, very truly and very necessarily. It is a reasonable function of this Society to enforce that doctrine, as also that "crocodiles are not alligators," and one or two other dogmas of the sort. The toucan and the alligator are not in India. The hornbills, however, we have, and three in our province, including what is, perhaps, the finest of the lot, *Dichoceros bicornis*, the "garuda" of the Konkans. This living caricature of the Prussian eagle is fairly abundant as far north as the hills under Mahableshvar, and may probably exist north of Bombay in Tungar and such places. Once seen and heard, it is never forgotten. Mr. Blanford quotes a

* "Toucan," Jerdon, 242, says that "this appears to be their name" (i.e., the hornbills,) "in some of the Malayan isles, the word signifying a worker from the noise they make." Now "Tukáng" certainly does mean a workman or "artisan" in Malay (*vide* Marsden's and Elout's dictionaries *sub voce*, but neither gives it as meaning a hornbill, though "Tugáng" means a pheasant; *what* pheasant is not stated. We cannot find "Toucan" in either of two Dutch dictionaries, but the French, Spanish, and Portuguese all give it for the American birds, of whom one conspicuous species is said to have a call like "Túcano"!

valuable suggestion of Mr. Ogilvie Grant, that the "extraordinary noise made * * * * while flying 'may be' produced by the air rushing between the quills" which are not covered at the base by other feathers, leaving a translucent spot that reminds one of the bull's-eye windows in some moth's wings. Here and on other (white) parts of the plumage one is apt to find a yellow stain, not part of the true coloration, but apparently laid on by the bird itself in the operation of "preening." "The food consists mainly of fruit, but insects and lizards are also eaten" to which we may add snakes. Indeed, any bird or beast that will eat lizards will also eat snakes if small enough, which is fair, because both lizards and snakes will commonly eat birds and their eggs on the same condition. The great hornbill, however, is on the whole much less carnivorous and insectivorous than the great Indian bustard (*Eupodotis*), and is as good for the table, that is, very second-rate game, but quite good enough to be very welcome as a change from tough fowl and goat. He is very much better than the "beefsteak-bird" (white-necked stork), but this delicacy of the past generation is not often found at a modern camp-table. Certain African hornbills are said to eat habitually not only snakes but carrion—low-lived fowls, which condescend to go on the ground; our hornbills will not, under less persuasion than that of an arrow. Their great size and frequent stupidity lay them open to the shafts of the Katkaris of Kolaba, and certainly, with the choice before us, we should choose a rook-rifle for their slaughter rather than a shot-gun. A wounded hornbill will often disappear into the forest in a way extraordinary for so great a bird, moving through the thick tree-tops without noise, and hanging on with a dying clutch, as green pigeons often do.

The extraordinary nidification of these birds is well described and illustrated by a "heading," to which the artist's name might as well have been put. Borrowed plates are fairly acknowledged throughout these volumes. Of our other Bombay hornbills, Jerdon's *Hydrocissa coronata* becomes *Anthracoceros*, and *Meniceros dicornis* (the common grey hornbill) *Lophoceros birostris*. It occurs as far south with us as the neighbourhood of Mahád in sight of Mahabaleshvar, but is not a bird of deep forest. *Anthracoceros coronatus* may be found

in the forests of the same neighbourhood. Something very like it has been seen there, but not brought to bag. It has been reliably reported from the next district—Ratnagiri. Mr. Blanford has well sealed the rejection of the specific name *malabaricus* for another *Anthracoceros*, the Bengal pied hornbill, which is not found in Western India, but seems to represent ours in the North-East and Burma.

Next come the hoopoes, a small sub-order closely allied to the hornbills, having only two families—one confined to Africa and one spread over the warmer parts of the Old World, though it has only one genus, *Upupa*. We have two species—the Indian hoopoe in all our districts out of Sind, and the European bird, a cold weather visitor to all but (perhaps) Kanara. The latter has white marks on its crest; the former none. A good many at least of our native members must be well acquainted with the amusing Semitic legends which connect this northern hoopoe with King Solomon and the Queen of Sheba (Queen Balkis), whose name Mr. Browning makes to rhyme with “just one small kiss”—a false quantity bad enough to make her turn in her grave.

Leaving these pretty and attractive birds, we follow our author to his next order: VI, *Macrochires*, swifts and “goat-suckers” (who do not suck goats). Of the former, our commonest is perhaps the Alpine *Cypselus melba*, “probably, with the exception of the larger species of *Chaetura*, the swiftest and most powerful flyer amongst birds.” But near Bombay the little palmswifts (*Tachornis*) are more common, and although Mr. Blanford does not report any of the genus *Chaetura* (spine-tailed swifts), from our province, we shall probably hear of them in it sooner or later. These wonderful birds are not very easy to observe when in a hurry, nor to catch and identify. Our most talked-of bird in this order is the Edible-nest Swift (*Collocalia fuciphaga*). It is a pity that the chance of getting rid of the specific name has not been taken. It implies that the bird eats sea-weed—which it does not—and so misleading a term was entitled to no more mercy than the specific names embodying errors as to distribution, from several of which Mr. Blanford has delivered us. The nests of this species, by the way, are recorded as inferior to those of *C. innominata*, “second sort nests” in short. Amongst the goat-suckers or night-jars we have several species of *Caprimulgus*; none, as yet

recorded, of *Lyncornis*, nor of *Batrachostomus*. They are not familiar birds to the eye, being night-flyers; but the note of two species (both of Bombay) is often heard at night and has given them the name of "ice-birds," resembling the sound of "ducks and drakes" made upon the ice by little boys with "chuckie stanes."

The next order is that of the *Trogones* with only one family, and in India only one genus, of which we have only one species, *Harpactes fasciatus*, the "ugly duckling" of a group containing several very highly-coloured birds. The eighth order are the *Coccyges*; with two families of which we have only one—the *Cuculidæ*. The true cuckoos, who head the list, are well known as perhaps the worst conducted of all birds; their matrimonial alliances are, at the best, ephemeral, the maternal affections are unknown, and all that a young cuckoo gets from either parent is the inheritance of a hideously unscrupulous talent for throwing his poor little foster-brethren out of their own nest. The fact that such a race of birds exists, and seems likely long to exist, is a distressing proof of the distance by which even the parental instinct of the highest birds is separated from reason. That most birds will try to mob cuckoos is true, but this seems to be due only to their finding the latter skulking about nests, and in some cases to their mistaking the cuckoos for hawks. None of the victims seems to be capable of telling a cuckoo's egg or young from their own, or of resenting the changelings' murderous evictions. Mr. Blanford furnishes one crumb of comfort in the assurance that sometimes two hen-cuckoos lay eggs in one nest of other birds, in which case (the right heirs being first got rid of) the bigger young cuckoo pitches the lesser after them; so he, at any rate, gets his deserts. He tells us further that one cuckoo did once hatch her own egg and fed her own baby (referring to 'Ibis,' 1889, p. 219). As there is little prospect of her finding imitators, it is recommended to all good men to shoot cuckoos at sight. The eggs, he says, are laid on the ground; and then conveyed by the mother "in her mouth to the nest (of another bird) selected."

We are cursed with several cuckoos, and firstly with the typical European bird, *Cuculus canorus*. This vermin, indeed, is not commonly found in our province in the breeding season—May and June, but Mr. Blanford shows its occurrence in latitudes as low at that season,

and the present writer has observed and heard it in the late hot weather in the Khandesh Satpuras, where the Bhils knew it familiarly enough to say that its peculiar call was a sign of rain.

As this is a breeding call uttered by the males only, these at least must be supposed to be in season then and there. But local proof of their finding what one can hardly call mates is apparently wanting as yet.

The Indian cuckoo, *C. micropterus*, is also found in our province, but "scarcely anything seems known about the migration and breeding." "Its call is a fine melodious whistle." We have also two "hawk-cuckoos," whose plumage and flight imitate those of hawks. But they are not known to presume, upon this, to put their eggs into hawks' nests. Probably, as their beak and claws are *not* raptorial, the tables would be turned on the young cuckoo who tried to evict a contemporary "eyas," whose beak is nearly as sharp as the mother-hawk's.

But another cuckoo, *Surniculus lugubris*, imitates the common "King-of-the-Crows" (*Dicrurus*), and does seem to profit by this disguise to put off its own eggs upon the latter bird. It is not yet recorded from our province, but will be—probably.

We have two crested cuckoos (*Coccyzus*), one of which, *C. jacobinus*, extends into Africa. The other, *C. coromandus*, with chestnut wings, has been once recorded in our province—by Mr. Vidal.

After these come the *Phœnicophainæ*, the most of whom are ground or bush cuckoos of irreproachable domestic manners. But at the head of them—apparently for want of a better place—we find the genus *Eudynamis* (spelt by Jerdon with two "ys"), of which we have one species, the well-known Koil (*E. honorata*).

This horrid bird appears to be created just to show that *something* can be wickedder and slyer than a crow. "Honoured" it is, indeed, by the natives of India, with the support of our author, for its "rich, melodious call-notes." Most Anglo-Indians are rather of the mind of that Griffin who answered to the thousandth shrill question "Who are you?" "I'll jolly soon let you know who I am, with an ounce of snipe-shot, you brute!" This, however, is commonly a vain threat. The koil, indeed, is bold enough in approaching and annoying houses and tents. And this is part of his wickedness; because he knows well that at short ranges his impertinent questions are more piercing and exasperating. But he can, hide his black plumage in

the thick and lofty tree-tops that he loves, as well as any of the green birds. And, like most fowl of monotonous notes, he seems, to a man's ear, a bit of a ventriloquist. This is probably an effect of echo, or other deception, as a call-note which led the female bird astray would be of little use. Or, perhaps, the frequent appearance of koils, copper-smiths, and corn-crakes in the place where you did not hear them is due simply to a rapid and silent change of place. Mr. Blanford gives the ordinary note as "kee-il," and another, uttered by the male alone, as "ho-y-o." It is the latter, of course, that gives the bird our Bombay name "Who are you?" There is, however, a third call or noise—an outburst of screaming clatter—which generally accompanies the koil's hurried flight across an open place in frantic flight from a pursuing crow who has forced him out of his tree. Jerdon mentions this, and a fourth "somewhat melodious and rich liquid call and thoroughly *cuculine*." He observes that the female "in general lays one egg only in each crow's nest, and mostly, but not always, destroys the eggs of the crow at the time of depositing her own"—a wise precaution, as the ejection of a young crow older than himself might be no easy job for the changeling. Further he quotes the native belief that "the crow discovers the imposture when the young koil is nearly full-grown and ejects it from the nest, but with dissent for reason given. Mr. Blanford's greater command of evidence helps us here. He does not mention the mother-koil's breaking the crow's eggs, but does say that "not unfrequently two or more koil's eggs may be found in the same nest." When this happens, we can hardly doubt that the strongest changeling evicts his weaker brethren—one of the few cases in which we can have no sympathy with the victim. The natives would give the credit to the old crows. They are slow to admit that a crow can be altogether made a fool of by any bird. But European observation is all to the effect that the crows are just as completely deceived as any other victim of any other cuckoo. And although they may often be seen hunting the male-koil, the female, quieter in colours and notes, seems usually to escape their notice, though she is their real enemy. It may well be that their pursuit of the male furnishes her opportunity for invading their nests. The koil does not seem to victimise any birds but crows. He is one of the "brain-fever birds," perhaps the chief; but the term is vague, and belongs rather to the "Bengal side of the Punkah."

And he is like the true cuckoos, and unlike the true *Phœnicophainæ*, an arboreal bird, using low cover little and the ground less.

From the company of crows and cuckoos we emerge into a clearer ornithomoral atmosphere ; and it is only for convenience' sake that we take the next genus (*Centropus*) a little out of its order. It has four species in India, of which we have one in Bombay, *C. sinensis*. Mr. Blanford has rid us of some unnecessary species, but observes that "those who require a distinct term for the Indian Peninsular bird should call it *C. castanopterus* (Stephens, 1826), and not, as hitherto, *C. rufipennis*." This is the "crow-pheasant" of most writers—a bad name, as it is neither a crow nor a pheasant. The commonest old English name in Bombay, "Malabar Pheasant," is not quite so bad, implying, with a gentle irony, that it was as like a pheasant as anything else in Malabar. Perhaps the best name would be the "Griffin's pheasant." For few of us have put one out of a roadside ditch for the first time without taking it for something "good to kill." Beaters and shikaris, mostly thinking it good to eat, are apt to encourage the idea with "ulterior motives." The best native name is the Maratha one, "Kumbhar-kukada" (Potter-cuckoo), which puts it in the right family and notices its queer mixture of black and red colours like those of an overburnt clay-pot.

Next the "Griffin's pheasant" (before and after him in our book) comes a lot of other *Phœnicophainæ*, for whom we may borrow half a name from the Telugu and call them "parrot-cuckoos." Most of them have the frame and plumage of a short-winged cuckoo, but an arched beak, more or less brightly coloured. They are birds of low cover and of the ground, and of academical interest chiefly.

The parrots constitute Mr. Blanford's ninth order, of which we have only one family and two genera. The second, *Loriculus*, is rather Malayan than Indian, and we have but one species, *L. vernalis*, the loriquet, or dwarf paroquet of the ghâts—a bird not common and apt to escape notice, as it is small, shy, and protectively coloured ; but it has been recorded up "to the latitude of Bombay."

We have taken it first to clear the ground, as the other Indian paroquets need some remarks. "Paroquet," it may be observed, is the best English name to use for them, leaving "parrot" to the short-tailed birds. The first to notice are the Alexandrine paroquets, of which Mr. Blanford enumerates four, careful to observe that they "are

merely races or sub-species of one well-marked form." Oddly enough, he will not allow any of them to be "the true *Palæornis alexandri*," which, he says, is a Javanese species. As the paroquets were introduced into Europe by Alexander the Great's expedition from India, it is a pity that this name should go to where he did not go, only because of a mistake made in the seventeenth century. The conqueror's birds were probably the classifier's *P. nepalensis* and *P. torquatus*, both of which occur on his route. *Palæornis torquatus* is the common rose-ringed paroquet of all the Indian plains, and the Greeks could not have helped seeing it in the Punjab and Sind. *P. nepalensis* is a forest bird, and therefore they may not have seen it wild; but it was probably a common cage-bird then as now. It and its three races are all characterized by a deep red wing spot, not found on *P. torquatus*. Alexander's men were the first Europeans who saw any parrot. Oddly enough, the Egyptians, who imported a good many birds and beasts from interior Africa, do not seem to have got parrots among them. At least these appear to be unknown on their older monuments. Herodotus is silent as to their occurrence, and Solomon, though he got "apes and peacocks," had no parrots on his bills of lading. Perhaps the parrots had not yet learnt to talk,* or surely sailors would have brought them home, as almost every sailor will now whenever he gets the chance. We have in Bombay both the birds above mentioned, but *P. nepalensis* does not seem to cross the Tapti to the south'ard. It may be represented in North Kanara by *P. eupatria*, a Ceylonese form. There is a third race in the Andamans and a fourth in Burma.

We have also a "blossom-headed paroquet," whose head is coloured like a ripe red plum, with the "bloom" on it. It has a red or orange wing-spot; but the thing to note is the conspicuous white tip of the chief tail feathers, which distinguishes it, on the wing, from our common paroquet, *P. torquata*. It is also more "jungly" and shyer, especially when breeding. The blue-winged paroquet occurs on the ghât forests up to the Malsej Ghât at least. One must stretch a point "compliment any of the tribe upon their talking, which is very poor compared to that of some African birds; and their natural screeching is merely a nuisance.

* The East African negroes are said, at this day, to have little taste or talent for taming and teaching animals.

The tenth order, the owls (*Striges*), "form almost as natural an order as the parrots, and occupy, both in external characters and in their anatomy, a position between" them and the true *Accipitres*. So far our author, Jerdon, though he did not give them an order to themselves, points out that they approach, "on the one side, the harriers, which have large ears, a ruff, and noiseless flight, and, on the other side, have some affinity with the parrots," one genus of which, the Australasian *Strigops*, is very owl-like in appearance and ways. At least one parrot has, within modern times, become carnivorous; but its full style and title are not here "convenient." It is a New Zealand bird, and manages to kill sheep by the hideous process of biting a hole through their backs. It may be added, although the authority is not very scientific, that the Katkaris of Kolaba count the "harrier-eagle" (*Spilornis*) to be a sort of owl. Many of the owls are very widely distributed, and the long lists of synonyms attached to their titles show that we have now been rid of a lot of unnecessary species. The first on the list, *Strix flammea*, is a case in point, the Indian "barn-owl" or "screech-owl" being now identified with the European bird. Further thanks are due from it and us to our author for that he has found "a sufficient excuse" for not disguising it as *Aluco*. He points out that several of its Indian names mean "bad bird," or "death-bird," indicating an old and wide-spread superstition. Mr. Swettenham, in a recent book, records a Malay belief respecting another owl (probably *Huhua orientalis*) that its appearance and cry announce the death of a raja; and probably some idea of the kind is current wherever owls are prevalent. The Maratha name only indicates the bird's cry. It is *Ghubad*, the second syllable short. We have only one other Indian *Strix* (*S. candida*), the grass-owl, often put up by quail-shooters. Mr. Blanford denies it to "the Bombay Deccan" and, by exclusion, to our area generally, leaving us another "grass-owl" (*Asio accipitrinus*), which we share with most countries outside the Polar circles. It is worth while here to remark that this is the horned grass-owl; so, if any Bombay sportsman shoots a grass-owl *without* horns, he is requested to attend to it and inform the editor of this journal. *Asio otus*, the long-eared owl, is found in Sind at times and is even recorded from Cutch. But it is a forest bird properly. We have two "wood-owls" (*Syrnium*) and one fish-owl (*Ketupa*) commonest upon forest rivers.

The great horned owl (*Bubo ignavus*), occurs in Quetta, and may very likely visit Western Sind and Baluchistan as a straggler. Its specific name (sluggard) is ludicrously inappropriate to a bird which can kill hares, crows, and even, it is said, fawns. The rock horned owl (*B. bengalensis*) is common with us, and may often be seen many miles from any rock where river banks are steep enough to serve its turn. The darker *Bubo coromandus* is only allowed to us in Khandesh and "the better-watered parts of Rajputana." But, as the province of Gujarat "comes cranking in" between these localities, the bird may be looked for in any of its north-eastern jungles, in the Panch Mahals, the Mahi and Rewa Kantas, Prantej, Morata, or the Gaekwad's inner dominions.

These are all fine birds, as big and strong as small eagles, and often called "eagle-owls." But perhaps that name would be better kept for the genus *Huhua*, in which the young has "a perfectly distinct plumage, an exceptional case amongst owls," but normal with eagles. *Huhua bengalensis* is found on the Nilgiris and in Malabar, and may very likely extend to our Ghât forests. It "is somewhat diurnal in its habits," but a regular owl in horn and hoot. The great snowy owl is a bird of similar size and anatomy to the last three or four owls, and is necessarily, in its own Arctic regions, a hunter by daylight all summer, when the darkness is short or none. It has once been procured in India at "Mardán" (? Hot-i-Mardán), but can hardly be expected to range into our province.

The next genus is *Scops*, composed of small owls with long horns, quite nocturnal, and chiefly insectivorous. The first has been eased of 15 unnecessary names and united with a European bird, *Scops gin.* The second is a Central Asian bird, *Scops brucei*, and oddly enough is reported in India chiefly from our province, *viz.*, from Ahmednagar and Khed in Ratnagiri, "probably in Western Khandesh," and naturally from Sind and Chaman where it breeds. A matter of some interest is that our own members are the chief witnesses to its Indian appearances, though it has been seen in Oudh and at Gilgit. "Kutruz" is given as a Maratha name. It is odd that so rare a bird should have a Maratha name at all, and probably this is a local name for more owls than one. We have one other of the genus, *Scops bakkamæna*, found all over "the oriental region." The specific name is given as a Singalese one for the brown fish-owl, and probably includes many owls.

After these come the dwarf owls or "owlets." The latter word properly means the young of the larger owls (in dialect, sometimes, the adult birds), and had better be kept for them. The first genus can now well afford to give up a mere conversational name, as Mr. Blanford has restored to them "Boie's peculiarly appropriate generic name *Athene*," of which they had been stripped in favour of certain butterflies. The butterflies' claim was based on "competent false witness," in the shape of a date "1816" on the title-page of a book "not really published until 1823 or 1824."

The alternative generic name for the owls was *Carine*—a pretty word enough, but liable to mispronunciation and having a rather remote meaning, "a lady who sings dirges." In our province these owls do not sing dirges, but chatter prophecies of good luck as well as bad, as shown in a pretty story in "Old Deccan Days." They are called Pingale. Oddly enough, so is the pied king-fisher, *Ceryle varia*, by the Kolaba Kolis. *Athene brama* is the common species; *A. blewitti*, a rare forest species; least rare, apparently, "at the foot of the Satpuras in North-Western Khandesh, where three specimens out of five recorded were obtained by Mr. Davidson. A third, *Athene bactriana*, is a Central Asian form, "a local race of *A. glauca*, which again is merely the eastern desert form of the South European *A. noctua*."* It is found in our limits in Baluchistan. Another dwarf genus is *Glancidium*, of which we have one species, *G. radiatum*, a forest bird. The dwarf owls have no horns, very little "facial disk" and ruff. They are, if not fond of broad daylight, at least quite ready to come out well before sunset, but do most of their hunting after it.

The last of the Order are the hawk-owls (*Ninox*). We have one, *N. scutellata*, a forest bird. The ruff and "facial disk" are "quite obsolete" (i.e., it has none), whence, in part, its hawk-like appearance and name. But it is still "chiefly nocturnal." It is rather smaller than (to name a well-known bird) the *Turunti* (*Æsalon chiequera*), and accordingly lives much on insects, which it hawks on the wing, but also on mice and lizards. Here ends the order of owls.

(To be continued.)

* *A. noctua* is supposed to have been the owl of Pallas *Athene* and therefore, like our Pingale, a bird of counsel rather than of ill-omen. The Egyptians paid no respect to it, though the "white and horned owl" appear on the monuments, and one of them is an hieroglyphic bird, standing for M.

MISCELLANEOUS NOTES.

No. I.—THE GIANT ORCHIS.

The Giant Orchis, *Habenaria Susannæ*, Brown,—*Platanthera Susannæ* Lindley,—Natural Order, *Orchideæ*, according to Dalzell and Gibson, the authors of the "Bombay Flora," occurs in the "Concans and Ghauts in several places, but nowhere abundant." The Honourable Mr. Birdwood, in his "Catalogue of the Flora of Matheran and Mahableshwar," says that "only one plant of this splendid orchis has been found by Dr. Cooke at Mahableshwar, and only one at Matheran." From my own experience of the Bor Ghaut range, I find that, though the Giant Orchis is commonly reported to be rare and nowhere abundant, it is certainly plentiful on the Bhoma Hill at Khandala, from which place the plant does not seem to have been recorded before.

On the Bor Ghaut the plant appears to grow towards the end of June or the beginning of July, and begins to flower about the middle of September. After the flowering is over and the fruiting is finished, the plant with the parent root-tuber gradually shrivels up and is ultimately withered in December or January, leaving in the ground a healthy young root-tuber crowned by a well-developed bud, from which the flowering-stem shoots up afresh the following season. In the axil of the lowest leaf of this bud there is always a minute bud in a rudimentary state. While the older parent root-tuber is withering away, the rudimentary bud continues to grow and finally swells out in the next season into a young bud-tuber, which, in its turn, becomes the parent of a new flowering-stem.

Sir Joseph Hooker gives the height of the stem from two to four feet. At Khandala, however, the plant attains a height of a little less than two to almost five feet.

The Marathi name of the plant is *Wagh-chaorá*, meaning the metacarpus of the tiger's foot. Among the Kathkaris, Thakurs, and other Marathi-speaking people living on the Bor Ghaut, the root-tuber of the Giant Orchis is believed to be a sovereign remedy for the cure of blebs or bullæ, especially those occurring on the metacarpus or the palm of the hand. These blebs or bullæ, on account of their supposed resemblance to the raised metacarpus of the tiger's foot, are known as *Wagh-chaorá* in the Deccan. Hence the vernacular name of the plant. There are some persons who believe that the plant is called *Wagh-chaorá* because the flower looks like the claws or jaws of a tiger.

R. M. DIXON, B.A.

BOMBAY, January, 1896.

No. II.—A LEPORINE MONSTROSITY.

One morning about three years ago some coolies told me that the day before on their way to work, they had come suddenly round a corner upon a hawk on

a stump, and that the bird, on taking wing, had dropped from its claws a leveret with eight legs. At my order they went and fetched it to me, but it was so decomposed—hair all slipping off—that I did not preserve it.

The leveret was a *Lepus nigricollis* about three or four days old, and a curious monstrosity. The head and fore legs were as usual, but at the shoulders the leveret divided in a V into two bodies, each with a pair of hind legs and tail, while between the shoulders, at the junction of the two bodies, an extra pair of fore legs stuck up straight into the air, making eight legs in all. I believe such monstrosities are much more uncommon among wild creatures than domesticated animals, so perhaps this instance may be worth recording. The hawk was most probably *Spilornis spilogaster*.

A. L. BUTLER.

COCOAWATTE, CEYLON, November, 1895.

NO. III.—BISON IN THE KAMPTEE CANTONMENT LIMITS.

Considerable excitement was caused on the 18th October, 1895, owing to the appearance of a fine pair of Bull Bisons on the Rifle Range here, well within the Cantonment limits, and at a time when a party of the 12th Bombay Infantry, under a European officer, were at musketry practice. I may add that there are those who say there were three seen and others four. However it is certain there were two.

They came within 200 yards of the party and about half a mile from the Railway station.

The following items of information regarding this hitherto unknown event were supplied to me by a native gentleman who, at my instigation, gleaned all the information available regarding them. I give it in his own words, which are not entirely destitute of unintentional humour: "When they were observed by the musketry party, a havildar asked permission to fire at them but was not allowed to do so. They then appear to have been observed by the Railway officials, who were joined by a crowd, and then appear to have gone towards them; but no one then appears to have fired at them. The musketry now being over, the havildar who first noticed them appeared on the scene, and in the meanwhile one of the beasts made off towards a village called Anjini, whilst its fellow came towards the crowd, causing a great confusion. The Havildar being a little in advance of the rest, the Bhaisa (Bison) chased him, but he succeeded in avoiding its attack by returning to the assembled throng of people. The brute then went and sat down near the Railway fencing. The havildar then climbed up the nearest tree, together with another naik of the same regiment and one Mr. Brown, and fired at the beast with a gun lent to him by the Station Master, wounding it in the right shoulder. Mr. Brown also fired, but missed and retired. The Bison therefore grew furious and crossed both Railway fencings and proceeded towards the Bazaar shortly pursued by the havildar, who again fired at him a second time,

wounding it on the same shoulder. It then fell, and as it was rising up, it was again fired upon and this time the animal was struck upon the forehead and settled. Subsequently a regular volley was discharged at the disabled animal by the Railway staff, so that it is not possible to say who dealt the fatal blow."

The head is in my possession, and the measurements are 30" from base to tip outside the curve, 16" round the base of the horn.

S. BANKS, Brigade-Surgn.-Lieut.-Col.

KAMPTEE, C.P., November, 1895.

NO. IV.—RED ANTS AS SMELLING SALTS.

Looking through a back number of the journal, I see E. H. A. records the jungle people in the Canara District eating red ants! (Vol. IV, p. 153).

The Tamil coolies here use them as *Smelling Salts*! I don't know whether the practice is common in India; anyhow it may be worth noting. The *modus operandi* is to go up to a nest in a bush, seize it with both hands, rub ants and nest together violently between the palms and then take a few good long sniffs of the strong ammonia-like fumes which rise from the mass of crushed and bruised insects.

I am told this instantly relieves a severe cold in the head if the sufferer has no objection to a few dozen of the more active ants burying their mandibles in various parts of his person while he is sniffing at the remains of their community!

I should object to this myself, so I cannot speak with authority as to the efficacy of the remedy.

A. L. BUTLER.

COCOA-WATTE, CEYLON, December, 1895.

NO. V.—THE FOOD OF THE MUSK-RAT.

Three or four times lately I have been disturbed at night by the cries of a bull-frog. I concluded that a snake was making a late supper, and, as I do not care about such company so close to the bungalow, I got up and, armed with a stick and a lantern, proceeded to hunt for it. On each occasion, however, it turned out to be a musk-rat, and not a snake, that had caught the frog, and I was much surprised to see the determined and savage way in which the attack was made. In one case I separated the frog and its assailant with a stick, but the moment the stick was withdrawn the latter actually ran over my feet in its eagerness to catch the frog again and, having caught it, proceeded to punish it frightfully, biting it about the head and back. I again separated them, and this time the frog managed to hide itself; and, when I returned to bed some minutes later, I left the rat still quartering the ground in the hopes of finding the frog again. On the other occasion, when they were not separated, the musk-rat, after some time, apparently succeeded in killing its victim

and dragged it ignominiously away, with the hind legs trailing limply behind, to a hole in the wall or fernery, where, I presume, the musk-rat ate the frog. I send this in case it may be of interest, and may elicit some further information regarding the food of the musk-rat and its methods of obtaining it.

G. K. WASEY.

MARMAGAO, 15th January, 1896.

NO. VI.—FIELD NOTES FROM CUTCH.

On the 26th December last, while out on ten days' leave in the northern part of Cutch, along the south shore of the great Rann, I was all day after Chinkara, and succeeded in bagging a good head of exactly 12 inches. On returning to camp at the village of D., and just as the sun was going down, my shikari spied a wolf trotting through some reeds in a half-dried salt marsh, evidently on its way to get a drink, and about 100 yards ahead of our cart. I got out quickly and loaded my rifle. Suddenly the wolf wheeled right round and went off at a tremendous pace. At first I thought she (it turned out to be a gaunt female) was bolting at sight of us, but my shikari said, "No Sahib, she is after a hare." I stopped the cart and stood upon it; thus getting a good view of as fine a chase as I have ever seen. A grey-hound, a good dog to boot, would have been utterly out of it both with regard to speed and turning powers. The wolf headed the hare almost immediately and kept on heading and turning it until it must have got quite sick from giddiness. Then they disappeared behind a jhás bush at the edge of a field on the left side of the cart track about 200 yards ahead of us. I waited a minute or two, expecting to see them re-appear the other side of the hedge, but, as they did not come into view, I proceeded quietly to the place where I had seen them disappear. On arriving within a few yards, the shikari said, "There it is, eating the hare; come this way, Sahib." I went round to the field side of the bush and then caught a glimpse of the beast feeding ravenously. On seeing me, it ran through the bush and came out again on the cart-track. I was round in the twinkling of an eye and on my knee when out came the wolf, trotting majestically and showing its teeth, about 30 paces off. Taking a fine sight below the shoulder, I fired, and hit her through the lower portion of the ear, the bullet traversing the skull and coming out of the right eye. The skull was smashed to pieces, and after a few kicks she lay still. We went to the place where she had caught the hare and found not a morsel left. When she was cut open and skinned next day, the mangled remains of the hare, which had evidently only been chewed up a bit and then bolted, were found. The whole chase only lasted three or four minutes, and the brute was swallowing its well-earned meat within fifty yards of a Kunbi working in his field, who, with the usual apathy of his race, took no interest whatever in the proceedings. Wolves are very plentiful and destructive this year in Cutch, and it is difficult to mark

them down, the country which they infest being for the most part a barren rocky desert. On the 27th we shot the big nala, well known to everybody who has shot there as a first-rate ground for duck and snipe. While waiting behind a large screen of reeds for the duck to be driven overhead, I saw a flight of a dozen common starling (*Sturnus vulgaris*) pass over my head. The nala contained a good many gadwall, wigeon, and teal, also a few mallard and spotbill, but the birds were so wild that we did not bring many to bag, and snipe-shooting was very trying owing to the immense number of swallows and martins flying about, which quite put one off. The nala is a veritable Irish bog, and woe betide the man who failed to put his foot (contrary to what we would do in Ireland though) on the greenest of grass tussocks. This makes the snipe-shooting still more difficult, as the wily bird always manages to get up when you have to leap from one tussock to another and have lowered your hammers to half-cock, or put your safety bolt at "safe." Grey lag geese, though never plentifully scattered in Cutch, were found in places where I have never seen them before. The avocet (*Avocetta recurvirostra*) is very plentiful this year. I have never seen it before, nor is it recorded in the "Birds of Cutch." Spotted sand grouse (*P. senigallus*) are very plentiful. It is extraordinary how some men—keen shikaris—will persist in calling this bird the "Pintailed grouse," to which it bears no resemblance whatever; simply because it has a pinnated tail I suppose. The true painted grouse (*P. alcheta*) does not occur at all here. *P. arenarius* (the "Imperial" as we call it) is not numerous this year owing to the poor rains and lack of food in the fallow fields.

The shooting here is, however, not equal to that of Kathiawar, but it is strictly preserved and no one may shoot without His Highness' permission. A strict close season is observed for all game except florican, rain-quail and sand grouse (*P. exustus*) from the 15th March to the 15th September. I have also to record the occurrence of *Falco babylonicus* (the Red-cap falcon), which has hitherto only been recorded from Sind. Two were shot by His Highness, whose shikaris said they were "shahin" (*Falco peregrinator*), but I identified them from Hume's description of a female shot by him, which he recorded in "Rough Notes," an extract from which appears in Barnes' "Birds of Bombay." The birds sent me tallied exactly with that description of *F. babylonicus*, but differed somewhat from Jerdon's.

His Highness the Rao tried to introduce the Somali guinea-fowl (common blue-headed sort) into his preserves at Godsar, some four miles from Bhuj, and turned several couple loose. Eggs were found (broken), but none of the birds have been seen for some time, and I fear they must have been destroyed, as wild cats of three species—jackals, mungooses, and foxes—are very abundant, and the birds must have become particularly tame after some weeks in confinement. Grain used to be thrown out for them at a certain spot, but after a time they gave up coming. The Somali spur-fowl (a Francolin of sorts) was also tried,

but the birds died before they could be let loose. Cutch is very suitable for several species of N. African Antelopes—*G. sommeringii*, *Oryx beisa* and *G. walleri*, and I am sure His Highness would be very pleased to receive any of the above and have them turned loose in some of his preserves. The two oryx—male and female—which I gave him in 1891 unfortunately died through over-feeding on the part of their keeper, who gave them oil-cake and goor of all things, and allowed them little or no exercise. They were eight months old when I brought them from Aden, and I had brought them up from calves of one month and two days respectively. They were very tame, but the bull was beginning to have the use of his horns.

Any that might be sent here for acclimatisation trial would be let loose at once in the preserves after the former experience.

C. D. LESTER, LIEUT., 17th Bo. Infy.

BHUJ, January, 1896.

NO. VII.—NOTE ON *VIRACHOLA PERSE*, HEWITSON,
A LYCÆNID BUTTERFLY.

Having lately reared several larvæ of *Virachola perse*, Hewitson, for the purpose of investigating the action of the ants attendant upon them, I now give an account of my observations, which, although very incomplete, may serve as a stepping-stone to further researches, if not as an explanation of the several rather conflicting accounts upon the subject.* In the first batch of larvæ I obtained on the Fagoo Tea Estate, British Bhutan, at 2,500 feet elevation, in June, 1895, the larvæ were about half-grown, and feeding on the interior of the fruit of wild pomegranates. In every case one larva occupied a fruit to itself, with one exception only, in which the fruit was inhabited by a half-grown larva, and was bored near the apex by a very small larva. The small larva, however, soon left the larger in full possession, and sought a fruit for itself. Some of these half-grown larvæ were attended by a black ant of slow movements with extremely flattened head and abdomen. As the hole made by the larva in the fruit was the same size as its anal scutate segment and that segment only was exposed, only two ants at most were found attendant upon the larva. The excrement of the larva, which would otherwise have filled up the hole, was presumably removed by the ants in order to allow themselves entrance. Although I never happened to observe this operation, still it is probable that it was so, as I occasionally found the hole filled with excrement, the attendant ants being on the outside of the fruit, and soon after found the passage cleared and the ants busied on the exposed segment of the larva. Of course, it is quite possible that the larva itself removed the stoppage by backing, as it must have done where no attendant ants were found. In the earlier stages the larvæ seem in a particularly unsettled state, residing in the interior of one fruit for a few days only, and then beginning on another.

*Vide de Nicéville's and Aitken's notes in "The Butterflies of India, Burmah and Ceylon," vol. iii, pp. 481, 482 (1890).

They are occasionally found on the outside of the fruit for a few hours, but I am of opinion that they do not remain outside for any great length of time, except in the case of injury, when they prefer to come outside to die. After this first batch of larvæ had been in captivity for two or three days, the black ants disappeared, and their places were taken by a far greater number of a smaller species of red ant, found commonly about every building and living in the crevices of window and door frames. I now removed a larva from its habitation in order to watch the operations of the ants more closely. On the example taken there were five ants, three of which seemed to wander about the anterior segments, and two paid close attention to the scutate anal segment. I noticed that those on the anterior segments did not seem to be doing anything in particular, only occasionally touching the back of the larva with their antennæ, and sometimes combing the same through their mandibles. These may have been taking up some of the fermented juice of the fruit from the larva's back and eating it, but there could be no certainty on the point, and the antennæ of those observed were only cleaned in this way at long intervals. The other two ants seemed in a far more excited state, and often ran to the upper part of the scutate segment, and continued for some time to keep up a sharp vibration of their antennæ, the tip of each of which alternately struck the larva. I noticed at that time that there was a depression in the segment between the points where the antennæ of the ant struck the skin, but I did not observe any moisture exuding from it, or did the ant, on any occasion of my observation, place its mouth in contact with the depression. These two ants seemed to be constantly attracted to the same place, and went through the same performance many times. I also noticed that on each side of the scutate segment there was an obliquely placed oval orifice which seemed to be of the same formation as the breathing apertures on the other segments, but that, instead of being dark coloured with a shiny dark margin, it was pale buff with a margin of the same colour. I am nearly certain that these are merely breathing apertures or spiracles and have no relation to these tentacle-bearing apertures which are found on the penultimate segments of other *Lycaenidæ*. My chief reason for holding this view is because, when the larva has buried itself wholly in the fruit, its breathing powers by the lateral spiracles would be extremely hampered if not altogether stopped, but the presence of these two spiracles on the scutate exposed segment enable it to breath with facility. There are no other similar apertures in the segment. It is possible that these may be the apertures mistaken by Mr. F. E. Pargiter in the case of the very closely allied *Virachola isocrates*, Fabricius (*vide* Butt. of India, vol. iii, p. 481) for tentacle-bearing ones. This larva was then allowed access to the broken fruit from which it had been taken, but it preferred to begin on a fresh fruit.

G. C. DUDGEON, F.E.S.

FAGOO, BRITISH BHUTAN, *September*, 1895.

No. VIII.—NOTE ON *LEHERA ERYX*, LINNÆUS,
A LYCÆNID BUTTERFLY.

The larva of *Lehera eryx*, Linnæus, is curiously similar to that of *Virachola perse*, Hewitson, with which I found it ; its habits are also identical. The only differences noted were as follows :—

Whereas in *V. perse* the medial segments were a deep red-brown, and the three anterior and three posterior segments ochreous, the medial ones in *L. eryx* were more purplish in tint (inclining to indigo when undergoing the pupal change), and the anterior segments more orange than ochreous. The last pair of breathing apertures in *V. perse* were pale buff (the others being black), but those of *L. eryx* were the same colour as the other lateral ones, viz., black with shiny black rims. Both larvæ had a quadrate buff patch occupying the central dorsal portion of the two medial segments, but in *L. eryx* the patch was rather smaller and paler than that of *V. perse*.

On 20th June, 1895, at Fagoo, 2,500 feet, British Bhutan, I found eleven pupæ of *Lehera eryx*, Linnæus, in the interior of the fruit of the wild pomegranate. They were enclosed in precisely the same manner as those of *Virachola perse*, Hewitson, which feeds on the fruit of the same plant. Out of these pupæ only one had the opening in the side of the fruit closed with a web, the rest being quite open, and, as the fruit was in all cases in a rotten condition, it was also occupied by small dipterous (fly) larvæ, and *Coleoptera* (beetles), in two or three cases with a very small ant which did not attack the pupæ, but I cannot see what use they could be to this insect as they are to other lycænids. The pupa is robust, reddish-brown mottled with fuscous, especially on the back and sides. In some specimens the first two abdominal segments were dorsally yellowish. The butterflies commenced to emerge within a week after I found the pupæ.

G. C. DUDGEON, F.E.S.

FAGOO, BRITISH BHUTAN, *September*, 1895.

PROCEEDINGS

OF THE MEETING HELD ON 14TH JANUARY, 1896.

A meeting of the members of the Society took place on Tuesday, the 14th January, 1896, the Hon. Mr. H. M. Birdwood presiding.

ELECTION OF MEMBERS.

The election of the following new members was announced :—Lieutenant A. R. Burton (Bolarum), Mr. A. Ryves (Allahabad), Mr. A. L. Butler (Ceylon), Mr. A. Earle (Bombay), Mr. Joseph Greig (Bigura), Surgeon-Captain W. H. W. Elliott (Dehra Ismail Khan), Mr. H. M. Thompson (Bombay), Mr. F. H. Sutton (Bombay), Mr. H. Slade (Burma), Mr. A. J. B. Hare (Jalpaiguri), Mr. S. P. Leggett (Kurachi), Lieutenant R. S. Gillespie, R.E. (Bombay), H. H. the Maharajah of Kotah (Kotah), Dr. Bassett Smith (Bombay), Colonel T. Freeman (Bombay), Lieutenant W. G. Nisbett (Burma), Mr. R. H. B. Taylor (Mangalore), Mr. Lionel Truninger (Malakhand), Surgeon-Captain F. E. Swinton (Poona), Mr. F. J. Rome (Bombay), Mr. A. H. Birkenshaw, C.E. (Gaya), Mr. E. P. Stebbing (Teesta), Lieutenant K. L. W. Mackenzie (Poona), Captain R. H. Rattray (Dera Ismail Khan), Mr. W. Jamrach (London), Mr. H. C. Sterndale (Jalpaiguri), Surgeon-Captain J. H. Sellick (Burma), Captain E. C. Townsend, I.S.C. (Burma), Mr. J. C. Rees, C.E. (Pegu), Mr. J. C. P. Maynard, C.E. (Bombay), Mr. S. B. Bates (Burma), Mr. T. H. Tilly (Burma), Surgeon-Captain A. G. Hojel (Bombay), Mr. E. McArthur Moir (Chakrata), Mr. J. A. McKee (Nagpore), Mr. James Dodgson (Bandra), Mr. A. G. Edie (Poona), Mr. E. R. Jardine (Bombay), Mr. W. H. Tarleton (Burma), Mr. H. FitzGerald Beale (Poona), Mr. Charles Chambers (Delagoa Bay), Mr. H. O. B. Showbridge (Bombay), Mr. G. L. Benwell (Hyderabad), Mr. H. A. Crump (Hoshangabad), Mr. W. T. Jardine (Oorun), Mr. J. A. Jeffrey (Bombay), Mr. T. Hollis (Bombay), Mr. James Adam, C.E. (Bombay), Mr. F. Linnell (Seoni), Mr. V. S. Fellowes Wilson (Calicut), Mr. R. Lambert (Sind), Captain M. Tighe (Sind), Mr. B. T. Coggan (Cachar), Mr. F. W. D. Trotter (Silchar), Mr. George Oakes (Ootacamund), Mr. Nowrojee Dorabjee Dhakmarvala (Bombay), Mr. Ambrose Rodocanachi (Bombay), Mr. F. Bagley, C.E. (Mandalay), Mr. J. W. Fellowes (Thana), Lieutenant H. B. Span (Trimulgherry), Surgeon-Captain J. B. Jamesoni, Captain E. Guinness, R.A. (Bangalore), Mr. J. Sutherland, C.E. (Burma), Captain A. Bourchier (Ellichpur), and Captain John Thornhill (Berhampore).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, acknowledged receipt of the following contributions since the last meeting :—

Contribution.	Description.	Contributor.
Sea Shells and Pearls .....	.....	Lieut. F. W. Wodehouse.
Photographs of Horns.....	.....	Major R. Pentland.
Japanese Crabs.....	Dorippe callida.....	Capt. John Campbell.

Contribution.	Description.	Contributor.
1 Bison's Head	<i>Bos gaurus</i>	Mr. N. Devlin.
1 Dhaman	<i>Zamenis mucosus</i>	Surg.-Col. T. Weir.
A number of Beetles .....	.....	Mr. E. Ansell.
1 Cobra (alive).....	<i>Naga tripudians</i>	Surg.-Capt. B. Lenmann.
1 Indian Ratel.....	<i>Mellivora indica</i>	Mr. J. W. Fellowes.
A number of Insects .....	.....	Mr. W. Mahon Daly.
2 Lesser Floricans	<i>Sypheotides aurita</i>	Mr. C. H. Kirkpatrick.
2 Panther Cubs (alive).	<i>Felis pardus</i>	Mr. G. Keatinge.
A Collection of Butterflies & Moths.	.....	Mr. A. St. J. Cooke.
1 Albino Snake.....	<i>Tropidonotus stolatus</i>	Surg.-Lt.-Col. Mapleton.
1 Snake	<i>Dipsas trigonata</i>	Mr. E. H. Elsworthy.
2 Snakes (alive)	<i>Silybura macrolepis</i>	Surg.-Col. T. Weir.
1 Daboia	<i>Viper russellii</i>	Col. Rowe.
1 Foetus	<i>Sus domesticus</i>	Dr. deMonte.
1 Skull of a Malay Tapir ..	<i>Tapirus indicus</i>	Vet.-Capt. G. H. Evans.
1 Cobra (alive)	<i>Naga tripudians</i>	Surg.-Col. T. Weir.
A collection of Sea Shells ...	.....	Mr. L. Penny.
3 Water Tortoises (alive) ..	<i>Kachuga smithii</i>	Mr. C. Maries.
1 Snake	<i>Tropidonotus stolatus</i>	Do.
Eggs of Ceylon Spur Fowl...	<i>Galloperdix singalensis</i>	Mr. A. L. Butler.
Eggs of Ceylon Hornbill ...	<i>Lophoceros singalensis</i>	Do.
A collection of Botanical Specimens.	<i>Cyperaceæ</i>	Mr. G. M. Woodrow.
1 Sparrow Hawk	<i>Accipter nisus</i>	Mr. Alfred Walker.
Fossil bones of Crocodile, Mastodon, and Rhinoceros.	From Gulf of Cambay	Mr. J. N. Unwalla.
1 Snake	<i>Zamenis gracilis</i>	Capt. Baugh.
1 Peregrine Falcon (alive)...	<i>Falco peregrinus</i>	Mr. A. J. Jardine.
1 Snake (alive).....	<i>Dipsas trigonata</i>	Mrs. Sanders-Slater.
1 Crow Pheasant (alive).....	<i>Centrococyx rufipennis</i>	Mr. R. N. Branson.
1 Snake	<i>Gongylophis conicus</i>	Mr. W. Thacker.
1 Bittern	<i>Botaurus sinensis</i>	Mr. N. S. Symons.
1 Snake	<i>Zamenis faciolatus</i>	Mr. J. Brand.
1 Daboia (alive)	<i>Vipera russellii</i>	Mr. A. Corrodi.
1 Snake (alive)	<i>Lycodon aulicus</i>	Do.
A number of Shells .....	.....	Lieut. A. J. Peile, R.A.
1 Hornet's Nest.....	<i>Vespa cincta</i>	Mr. W. P. Thomas.
1 Black-necked Stork (alive)	<i>Mycteria australis</i>	Mr. H. Boardman.
1 White-breasted King-fisher (alive).	<i>Halcyon smyrnensis</i>	Mr. J. Brand.
1 Black-capped King-fisher (alive).	<i>Halcyon pileata</i>	Do.
1 Crocodile's skull	<i>Crocodilus palustris</i>	Mr. R. H. Lee.
1 Boar's skull	<i>Sus indicus</i>	Do.
1 Panther's skull	<i>Felis pardus</i>	Do.
2 Snakes.....	<i>Tropidonotus plumbicolor</i> ..	Do.
1 Shoveller.....	<i>Spatula clypeata</i>	Mr. N. S. Symons.
1 Gadwall	<i>Chaulelasmus streperus</i>	Do.
1 Crested Grebe	<i>Podiceps cristatus</i>	Do.
1 Black-tailed Godwit	<i>Limosa ægocephala</i>	Do.
1 Black-throated Weaver Bird.	<i>Ploceus bengalensis</i>	Do.
A Painted Bat	<i>Kerivoula picta</i>	Sergt.-Maj. Griffiths, R.A.
5 Slender Loris	<i>Loris gracilis</i>	Mrs. A. Breul.
A number of Beetles .....	.....	Mr. H. S. Ferguson.
1 Snake (alive).....	<i>Dryophis mycterizans</i>	Mr. H. Otto.
2 Tree Mice	<i>Vandelluria oliveacea</i>	Mr. Babajee Gopal.
23 Snakes from Coonoor .....	.....	Mr. Charles Gray.

Contribution.	Description.	Contributor.
1 Flamingo	<i>Phoenicopterus antiquorum</i>	Mr. Douglas Bennett.
1 Wood Snipe	<i>Gallinago nemoricola</i>	Mr. Thomas H. Moore.
1 Snake	<i>Zamenis diadema</i>	Sur-Capt. W. Ricketts.
1 Sucker Fish	<i>Echeneis albescens</i>	Mr. A. Corrodi.
1 Black-necked Stork	<i>Mycteria australis</i>	Mr. N. S. Symons.
1 Snake Bird.....	<i>Plotus melanogaster</i>	Do.
2 Leaf Insects from the Seychelles (alive).	<i>Phyllium scythe</i>	Capt. Whitehead.
1 Sparrow Hawk (alive).....	<i>Accipiter nisus</i>	Mr. J. Brand.
1 Pale Harrier	<i>Circus macrurus</i>	Do.
1 Black-throated Wood Partridge.	<i>Arboricola atrogularis</i>	Lt. H. A. D. Fraser, R.E.

CONTRIBUTIONS TO THE LIBRARY.

Description of Indian Squillidæ (Wood-Mason), from Indian Museum; the Spiders of Burmah (Thorell), from Mr. E. W. Oates; the Movements of the Kosi River, from Mr. F. A. Shillingford, Proceedings of the Zoological Society of London, Parts I, II, and III, from Mr. W. F. Sinclair; the Flora of Ceylon, Vol. VIII, from Dr. Trimen; the Birds of India, Vol. III, from Mr. W. T. Blanford; Back Numbers of our journal, from Mr. L. Penny; the Flowering Plants and Ferns of N. S. Wales, from Mr. J. H. Maiden; and Report on the Experimental Farm at Poona, from Government.

PAPERS READ.

The following papers, which were then read and discussed, will appear in the next number of the Society's Journal:—1. The Flora of Matheran and Mahableshwar, by the Hon. Mr. Birdwood. 2. Ornithological Notes from Cocoawatte, Ceylon, by A. L. Butler. 3. Sea Shells collected at Aden, by Captain E. R. Shopland, R.I.M. 4. The Butterflies of the North Canara District, by J. Davidson, I.C.S., T. R. Bell, and E. H. Aitken. 5. Description of a New Indian Snake, by G. A. Boulenger. 6. Indian *Chrysididæ* by Vicomte Robert du Buysson. 7. Miscellaneous Notes. (a) Bison in Kamptee, by Brigade-Surgeon-Lieutenant-Colonel S. Banks. (b) The Giant Orchis, by R. M. Dixon. (c) A Leporine Monstrosity, by A. L. Butler. (d) Red Ants used as Smelling Salts, by A. L. Butler.

A vote of thanks was passed to Mr. Birdwood for his valuable paper and interesting remarks.

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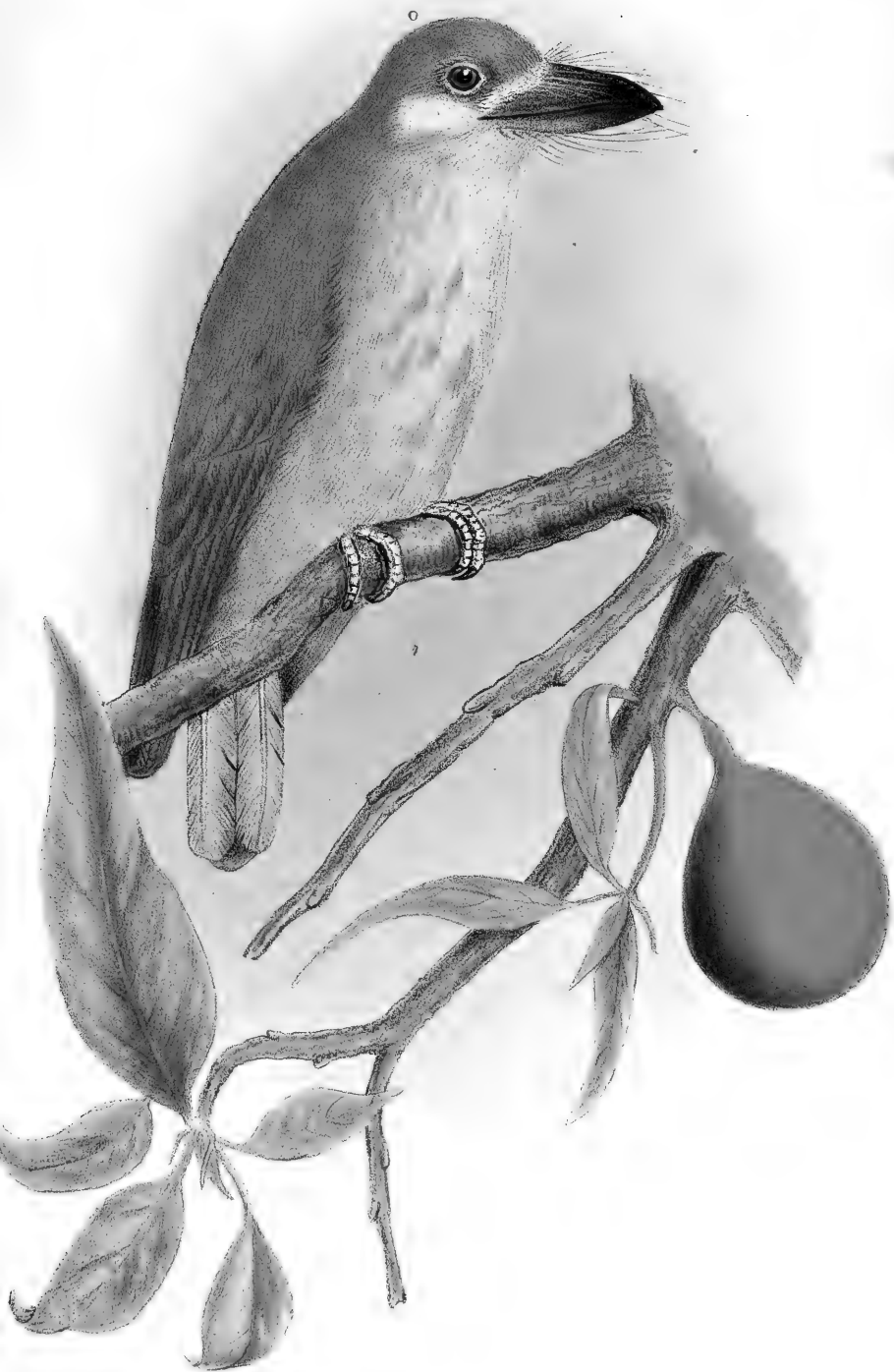
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C.S. Baker del.

MEZOBUCCO ROBUSTIROSTRIS. (Sp. nov.)
The Large-billed Barbet

Mintern Bros. Chromo lith London.

E R R A T A .

- Vol. X.—Page 331, line 21, for “jhás” read jháó.
Page 331, line 38, for “meat” read meal.
Page 332, line 11, for “we” read one.
Page 332, line 21, for “painted” read pintail.
Page 332, line 22, for “*alcheta*” read *alchata*.
Page 332, line 37, for “oreserves” read preserves.
Page 332, line 40, after “species” dele — and substitute a comma. Also in the same line after “foxes” dele —

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BOMBAY.

[No. 3.]

THE BIRDS OF NORTH CACHAR.

PART VI.

BY E. C. STUART BAKER, F.Z.S., M.B.O.U.

(With Plate F.)

(Continued from page 168.)

ORDER—SCANSORES.

Family *Picidae*.

Sub-Family *Picinæ*.

(376) *GECCINUS STRIOLATUS*.—The Lesser Indian Green Woodpecker.

*Hume, No. 171; Blanford, No. 948.**

There is a specimen from Cachar in the Hume Collection in the British Museum, so it must undoubtedly be accepted as a Cachar bird. I have never met with it myself, nor have any of my collectors, so that, at all events, it must be a very rare bird, as it is not one to be overlooked, being quite as noisy as most of the other species of the same genus.

* Shortly after the manuscript of this article was completed, I received the 3rd Vol. of the Birds in the Fauna of B. I. series, and I now give Blanford's serial numbers. These numbers are not in sequence owing to the fact that the 3rd Vol. of the Birds does not agree entirely in classification with Oates' edition of Hume's "Nests and Eggs" which classification I adopted as being a continuation of that contained in the first two volumes of Birds,

(377) *GECCUS OCCIPITALIS*.—The Black-naped Green Woodpecker.
Hume, No. 172 ; Blanford, No. 950.

An exceedingly common bird at all elevations. It seems to breed here earlier than in most other places. April is almost late for it, many lay in March, and not a few are already sitting by that month.

I think five is the largest number of eggs ever laid, generally but four, at other times only three.

It is very noisy, but its cries are not so loud as those of *Chrysocolaptes*, though quite as continuously uttered. It is not at all a shy bird.

(378) *GECCUS CHLOROLOPHUS*.—The Lesser Yellow-naped Woodpecker.

Hume, No. 174 ; Blanford, No. 951.

This handsome little Woodpecker is very nearly as common as the last, but does not ascend nearly as high ; I have not found it at any place over 4,000 feet, and it is most common from the plains up to about 2,000 feet. This species may be found in almost any sort of country, but it particularly affects *thin* evergreen forest, and I think it usually breeds in such places. I have known it make its nest-hole some two feet from the ground, and at other times between forty and sixty feet up in a branch of some large tree, perhaps quite inaccessible. It lays from three to five eggs, for, though I have never taken five eggs from a nest, I have taken five young. The eggs are similar to those of *G. occipitalis*, but average far smaller, and are also, taking a large series into consideration, less pointed. Twenty-four eggs average only $\cdot 94'' \times \cdot 78''$, and the longest and broadest are $1\cdot 07''$ and $\cdot 86''$ respectively, and the least both ways $\cdot 88''$ and $\cdot 68''$. They breed principally in early April.

Both this species and the next, when under the influence of "love's young dream," give vent to a low chucking sound utterly unlike most woodpeckers' noises. It can easily be imitated by rapidly uttering the "chuck" which one makes to urge on a horse. I have never heard the sound except late in the evening, when quite dusk, and it was some time before I found out what bird it was which made it, indeed until I actually followed up a pair of birds and shot them, whilst in the act of chasing one another and continuously uttering these sounds, I was under the impression that I was listening to some kind of bird quite unknown to me.

It is a bold bird at all times, easy to shoot and still easier to watch, but in the breeding season, in the dusk of the evenings, it is simply foolhardy in the way it will approach within a few feet of any fairly quiet watcher.

(379) *CHRYSOPHLEGMA FLAVINUCHA*.—The Greater Yellow-naped Woodpecker.

Hume, No. 175 ; Blanford, No. 955.

It is strange that Hume, neither in Cachar nor in any of the adjoining States, should have met with this Woodpecker, which is not by any means rare from the level of the plains up to some 2,000 feet, above which it seldom ascends.

I have taken a good number of nests, and these have generally been found in forest, that which is fairly thin but with a fair amount of undergrowth being preferred.

Unlike the last bird, it seldom makes its nest-hole above some twenty feet from the ground, but, on the other hand, I have found none under six or seven feet from it. It also seems to prefer the trunks themselves to branches or large limbs, and the burrow is not often very deep.

The normal number of eggs is three, but I have a clutch of four eggs in my collection which were taken on the 23rd of May, 1890.

The eggs are quite undistinguishable from those of *Gecinus occipitalis*, and do not average any larger, indeed, that which is most striking about them is their small size when compared with the bird which lays them.

They vary between 1·09" and 1·40" in length, and in breadth between ·80" × 1·02". I think they are not proportionately quite such long or such pointed ovals as are the eggs of *G. occipitalis*.

The colours of the soft parts are as follows :—Irides red, red-brown or crimson-brown ; bill very pale bluish-lead colour, the top almost white and rather transparent, the base much darker, almost black about the nostrils. Legs greenish-brown or lead-brown of a dull tinge.

I have never seen this Woodpecker in parties, but, on the other hand, very seldom singly ; where one bird is the pair to it, it is sure to be close at hand. It is not a very noisy bird,—for a woodpecker,—but the two birds constantly call to one another in a subdued cry that is not heard very far off.

(380) *GECCINULUS GRANTIA*.—The Pale-headed Woodpecker.*Hume, No. 177 ; Blanford, No. 958.*

This is now here very common, but is scattered thinly all over these hills as well as the plains. It is a shy bird, more so than most woodpeckers, and shuns observation. I have seen it in bamboo jungle, thin forest with heavy undergrowth, thick forest with none, and even in scrub jungle. Its note is not a loud one, more musical, or perhaps, I should say, less unmusical, than that of most birds of this family, and it has a decidedly plaintive, querulous tone about it. I have never seen it at any height up in trees, and it seems to prefer to keep below some twenty to twenty-five feet. It goes about either in pairs or small parties, generally the former.

I have notes on only one nest of this bird. The nest-hole was made in a dead stump standing in dense bamboo jungle, and was some twelve feet from the ground. The entrance was very large and looked like a natural one, the edges of which had been rounded and smoothed off by the birds ; it led to a large hollow about a foot in diameter and less than that in depth. The contents consisted of three eggs, in shape broad ovals, a little compressed towards the smaller end but not much pointed. They measure $1\cdot04'' \times \cdot77''$, $1\cdot05'' \times \cdot74''$ and $1\cdot02'' \times \cdot76''$, the texture being the same as that of the eggs of *G. occipitalis*. The nest was taken at Gunjong about half a mile from my bungalow, on the 20th May, 1892.

I have taken other clutches of eggs and, though I have kept no notes or measurements of them, I do not think they differed in any great respect from those I have here described, unless in being rather smaller.

The colours of the soft parts are not given in the British Museum catalogue and, as those I have noted differ from those given by Jerdon, I add them here.

The male has the bill a pale horny-blue, the maxilla wholly of this colour, though tipped paler, the mandible darker at the base for nearly half the length of the bill. Irides reddish-brown, legs dull green.

The female has the bill the same colour, but both mandibles darker at the base and round the nostrils. Irides brown or reddish-brown. Legs, dirty-greenish. The maxilla of the male is lighter throughout than that of the female.

The young male has the whole upper part of the head and nape the colour of the female's, but paler and lighter, and each feather tipped red; those I have shot, however, do not show a paler chin and throat and have no purple tinge on the upper plumage, which is merely duller and browner than that of the adult bird.

(381) *DENDROCOPUS DARJILENSIS*.—The Darjeeling Black Woodpecker.

Hume, No. 155; Blanford, No. 964.

A very rare bird indeed in North Cachar and confined entirely to the higher parts of the country in the North-West. I have not seen half a dozen birds in as many years.

Three eggs, which were taken from a hole high up in an old oak tree, in one of the larger branches, measure $1\cdot16'' \times \cdot90''$, $1\cdot16'' \times \cdot86''$ and $1\cdot16'' \times \cdot86''$. These are broad ovals, two rather pointed, the third less so. They are not as glossy as are the eggs of most of this family. They were taken on the 16th of April, 1888.

This is the only Woodpecker I have met with here, which I did not expect or, at all events, consider possible I should meet with. From the little I have seen of it, it appears to be chiefly a forest bird.

(382) *DENDROCOPUS MACUL.*—The Indian Spotted Woodpecker.

Hume, No. 157; Blanford, No. 967.

To be met with all over the district, but nowhere in very large numbers.

(383) *IYNGIPICUS PYGMÆUS*.—The Himalayan Pigmy Woodpecker.

Hume, No. 163; Blanford, No. 974.

I have at present only two birds in my collection, which can, without doubt, be placed amongst those of this species. In these birds the central rectrices are wholly black, and the next pair practically so, having merely a tiny speck of white on the outer webs, about half-way down the feather. The upper tail-coverts are quite unspotted black. I have seen other birds in Cachar quite as typical specimens of *I. pygmæus* as these are, and I have seen many with the four central tail-feathers either black or almost so, but very few with the upper tail-coverts not barred with white, though a few have the central and longest ones all black. I once came across a pair of birds, one of which was a typical *I. pygmæus*, whereas the other was almost as typical a *I. canicapillus*.

- (384) *LYNGIPICUS CANICAPILLUS*.—The Burmese Pigmy Woodpecker,
Hume, No. 163 bis ; Blanford, No. 965.

Extremely common all over the district.

- (385) *PYRRHOPICUS PYRRHOTIS*.—The Red-eared Bay Woodpecker.
Hume, No. 176 ; Blanford, No. 978.

This Woodpecker is not at all uncommon in suitable localities, but it seems to never wander far from streams of some size, and all my specimens have been taken from the low valleys through which such run. Along both the Jetinga and Diyung rivers it is very common indeed, on the Mahar less so, and on the higher valleys absent. It is such a very noisy bird that, shy as it is, one cannot help knowing when they are about, even though it may take a little trouble to get within sight of them. Their most ordinary cry is very much the same as that of the common little brown squirrel. More than once have I gone some way into the jungle under the impression that I was pursuing one of these birds, eventually coming across a squirrel, hanging on to a bamboo, jerking his tail and quivering his small carcass as he gives vent to an anger that in a large animal would be terrific, but with him probably only means that he has just recollected an insult he received some two years before.

The Bay Woodpecker keeps very close to the ground in feeding, though I have not actually seen it on it, as Hume seems to have done in Manipur. At the same time it is very partial to any fallen logs, but then, so are most woodpeckers ; for such being naturally very rotten contain a large number of insects. They also feed much amongst the roots of and low down in the larger clumps of bamboos, occasionally mounting some few feet up them.

Hume notices their very swift flight ; this I have not done, but at the same time should call them very *quick* in all their movements, both when on the wing or when clambering about trees, etc. ; when flying for any distance their flight has seemed to me but little quicker than that of other birds of the family, though, I think, it is less laboured and dipping.

I have twice found their nest-holes, both of them in the Jetinga Valley, and both, I think, below 500 feet altitude. The first hole contained only a single egg, measuring 1·17" × ·80". A long, narrow,

pointed egg, intensely glossy, and with a very fine close grain. This was taken on the 12th June, 1893, the male bird being shot as he flew away.

The same month, on the 23rd, I was lucky enough to come across another nest, and this time it contained four eggs. These, though not so long, are a good deal broader, and measure $1.13'' \times .88''$, $1.12'' \times .87''$, $1.11'' \times .90''$ and $1.10'' \times .82''$. They are quite as pointed as the single egg and, though a trifle less glossy, equally hard and close in texture.

(386) MICROPTERNUS PLEOCEPS.—The Bengal Rufous Woodpecker.

Hume, No. 178; Blanford, No. 983.

Common everywhere, up to five thousand feet, but more so below two thousand than it is above that height. It keeps a good deal to jungle that is partly composed of bamboos, and not being a noisy bird, comparatively speaking, is not so often noticed as it would otherwise be. This is the species which often makes its nest-hole in the black, papier-maché-looking nests of one of the tree ants. I have personally only once taken eggs from such a position, but I am sure that I have seen over twenty such.

It does not invariably lay its eggs, however, in ants' nests, for I have myself taken them from a hole in a tree.

Mention has been made of the Woodpeckers and ants living in amity in the same nest, but all those which I have seen occupied by Woodpeckers, were so by them alone, unless the ants were inside the birds, which I consider a highly probable solution of the matter. They *do* eat these ants, for I have taken them from their stomachs, though I had examined a good many birds before I ascertained that such was the case.

(387) BRACHYPTERNUS AURANTIUS.—The Golden-backed Woodpecker.

Hume, No. 180; Blanford, No. 986.

This is a rare bird in the hills, but less so in the plains of Cachar, though nowhere at all common.

Hume does not mention this bird in Vol. XI. of "Stray Feathers" (Birds of Manipur, Assam, etc.), but there is a skin in the Museum amongst those of his collection with a label shewing it as having been obtained in Cachar, and I may mention here that I noticed it several times in the district of Kamrup in Assam.

(388) TIGA SHORII.—The Large Three-toed Woodpecker.

Hume, No. 183 ; Blanford, No. 989.

I have seen but one bird of this species, and that was caught on its nest on the 17th of April, 1889. The eggs, of which there were three, measure $1.26'' \times .80''$, $1.23'' \times .86''$ and $1.23'' \times .80''$. They are the longest, proportionately, woodpeckers' eggs in my collection, and, with the exception of the first mentioned egg of *P. pyrrhotis*, the most hard, close-grained and glossy.

I know nothing about the bird or its habits.

(389) CHRYSOCOLAPTES GUTTA-CRISTATUS.—The Bronze-backed Woodpecker.

Hume, No. 166 ; Blanford, No. 992.

Next to *G. occipitalis* the most common species of Woodpecker in North Cachar.

I have taken any number of nests of this bird, and cannot at all understand how it was that Messrs. Darling and Davison never found more than one egg in a nest.

Four are very often laid, and sometimes as many as five, whilst less than four are seldom met with. This Woodpecker, like many others, often lays its eggs at long, very long, intervals : as a rule, two are laid at an interval of a day or so, and then a week or more may elapse before the others are laid. Thus I have found in the same nest-hole, a nearly fully-fledged bird, two half-fledged and two just hatched ; another time I found three young birds, one a good deal more advanced than the other two, and two eggs. Two young and two eggs I have seen more than once. Addled eggs are extremely common, and I should say that one nest in three contains one or more addled eggs.

I do not think the eggs could be discriminated from those of *G. occipitalis*, and though I think they average somewhat larger, I cannot say for certain, as I regret that I have kept no notes on measurements, a fact due principally to my getting so many eggs of this species that I have never troubled to measure them. The only four eggs which I have retained for my own collection measure $1.23'' \times .91''$, $1.30'' \times .94''$, $1.24'' \times .85''$ and $1.25'' \times .86''$. They are rather pointed, two decidedly more so than the others, and are not very glossy. They were taken from a hole in a tree, at about five feet

from the ground, on the 7th of June, 1888. They were, three of them, very hard set, the fourth being addled.

They breed principally in early April, a few in May, but very few as late as June.

Their nest-holes are nearly always placed very low down in the trunks of large trees; they are close sitters, and may sometimes be caught on the nest.

(390) *HEMICERCUS CANENTE*.—The Heart-spotted Woodpecker.

Hume, No. 165 bis; Blanford, No. 995.

This is a rare bird in the hill portion of the country, but Mr. Inglis informs me that it is far more common below.

(391) *HEMILOPHUS PULVERULENTULUS*.—The Great Slaty Woodpecker.

Hume, No. 168; Blanford, No. 996.

Hume did not meet with this bird either in Sylhet or Cachar, and there are no specimens in the British Museum from these localities, still it is not a rare bird up to about 3,000 feet, and it is so noisy and utters its cries so continuously that one is forced to notice it if it is anywhere within half a mile.

I have only taken, myself, one nest of this bird which contained eggs, and this was placed in a large cotton-tree at an immense height from the ground. It was a matter of two days' labour before the nest was reached, the native having to make a ladder by driving bamboo pegs into the trunk to a height of some 40 or 50 feet, after which he got amongst the branches. The nest contained three eggs, and there can be no mistake as to their identity, for the whole time the birds kept visiting the tree, though not coming within sixty or eighty yards of it, screeching at the tops of their voices and palpably in a tremendous state of excitement. Had I not personally superintended the taking of the eggs I should have thought they belonged to some other bird, though to what I could not say.

In shape they are very broad ovals, very little compressed towards the smaller end, which is slightly pointed only, the shell is fine and close-grained, but not so glossy as are most eggs of this family, and somehow do not bear the stamp of *woodpecker* on them at all plainly; they seem, however, to be the normal type of egg, for one I took from the oviduct of a female was very similar, though slightly longer, and others brought

to me since could not be distinguished from them. Moreover, those found by Bingham (Hume's "Nests and Eggs," vol. II, p. 315) seem to have been much the same, though slightly narrower than mine, which measure $1.45'' \times 1.16''$, $1.44'' \times 1.16''$, and $1.34'' \times 1.13''$.

Different individuals of this species seem to vary very much in temperament; I have seen birds so wild that I could not get anywhere within shot of them, yet on another occasion I had a shot at one of a pair of birds, missed, went on after them, had another shot and got the male, and then shot the female, who had flown to another tree not fifty yards beyond that on which I shot her mate.

Should one of a pair be shot, the remaining one will stay for days near the place, calling loudly all day, except during the very hottest hours, from 12 to 2 or 3 in the afternoon.

It does not *always* make its nest very high up, for there is one, now just completed (9th April, 1895) and not far from this place, Gunjong, which is in a big dead trunk of a tree some thirty feet high, about half-way up which the hole has been excavated.

The noise made by this woodpecker in tapping on trees is different to that made by any other woodpecker which I know, though some of the big birds of the genus *Thriponax* may make the same. It is a very deep noise, and seems, after the first tap or two, to go off into a series of reverberations.

It goes about in parties from four to six in number as a rule, though I once counted ten together, and this party did not, as I expected, split up into two when frightened away by a gunshot.

They are extremely pertinacious in the way they refuse to leave any spot where food is plentiful. During April, 1895, I was camping in the Mahar Valley, and near my camp were some four or five huge trees, their trunks, which were much scarred, split and broken up, doubtless harbouring vast numbers of larvæ and other insects. These trees were regularly haunted by two pairs of slaty woodpeckers, and from the way they refused to leave the vicinity I thought they must be breeding. A careful search brought no nest-hole to light, so eventually I fired two long shots at one pair, but missed both; nothing daunted, both pairs were back again in the evening, and I got snapshots at two, getting both. Even then the remaining pair kept returning to the place, and at last, after many misses, one of my collectors succeeded

in getting one of them also, after which the fourth bird flew away and did not return again whilst I was camping there.

I think the red throat of the male of this species is seasonal ; I have never seen any trace of it in males shot before March, whilst all those shot in April have it very strongly developed.

(392) *PICUMNUS INNOMINATUS*.—The Speckled Piculet.

Hume, No. 186 ; Blanford, No. 1001.

This is a rare little bird in Cachar, strange to say more rare in the hills than in the plains, and I do not think I have seen half-a-dozen specimens since I have been in the district. A pair, together with a dead bamboo in which they had made their nest and laid three eggs, were brought to me in the Laisung Valley on the 26th of April. The three eggs averaged $\cdot 57'' \times \cdot 46''$.

They were very hard set and quite unblowable. In shape, texture, etc., they are not to be distinguished from those of *Sasia ochracea*. In the plains this and the next species seem to be met with in about equal numbers, and both seem to keep much to *ekra* jungle. Here the Speckled Piculet is found chiefly in jungle consisting either of the small clump bamboo or the still smaller single bamboo, but where the elephant grasses grow *very* high it may also be found creeping about their stems.

It is an early breeder. I have taken no eggs later in the year than those mentioned above, and have seen others, hard set, in March.

I know nothing hardly of its habits, and such little as I do know calls for no remark, being the same as I have observed in *Sasia ochracea*.

(393) *SASIA OCHRACEA*.—The Rufous Piculet.

Hume, No. 187 ; Blanford, No. 1002.

Very common all over North Cachar.

I note the soft parts as follows :—

Upper mandible blackish, grading into pale plumbeous at the tip ; lower mandible lead-colour, fading almost to white close up to the tip, which is dusky. Eyelids and ophthalmic skin crimson in the male and reddish in the female, fading, in both sexes, to a dull red very soon after death. Irides crimson or crimson-brown. Legs vary greatly ; red, yellowish-red, dull orange or greenish-red. The bill, in old birds, is covered with minute corrugations on the whole of the upper and on the base of the lower mandible.

This bird generally selects a dry bamboo in which to make its nesting arrangements ; the hole, as a rule, is made only a few inches above one of the nodes, but sometimes it is placed just below the one above and next to that on which the eggs rest. The nest itself is formed of a mass of tiny chips and shreds from the inside of the bamboo, and, even when it uses a branch of a tree to bore its hole in, there is always a foundation of soft scraps for the eggs to lie on. I once found a nest of this bird in a small bamboo which had been cut away at the base by some passer-by, but had caught above on the other bamboos and was hanging there, swaying about in the wind. I should have missed the nest myself, for, though I almost touched the bamboo in passing, the bird did not fly away until I had passed, and it was then noticed by a friend who was out shooting with me.

It is a most rare thing for the nest to be made in a tree, and I have only come across two or three such ; and these were all in small branches, not in big ones or in main boughs.

The full complement of eggs is four, though they sometimes lay but three. They are extremely stout little eggs, of hard texture and very glossy, shaped very regular ovals as a rule, sometimes slightly compressed towards the smaller end, but *always* very blunt. They vary in size between $\cdot 65'' \times \cdot 52''$ and $\cdot 54'' \times \cdot 45''$, the average of eighteen eggs being $\cdot 60'' \times \cdot 50''$ or a fraction less in breadth. They breed all through April, May, and June ; but though I took an egg from the oviduct of a female as late as the 25th August, I think most birds breed in April.

This tiny woodpecker is a queer little miniature in many of its ways of *Chrysocolaptes sultaneus*, its piping little cry being a perfect caricature of that of the bigger bird.

It keeps principally to bamboo and reed jungle, but is sometimes found very high up on lofty trees ; and I shot a pair once at Diyung-mukh, which used to haunt alternately the extreme top of a very lofty cotton tree and the reed jungle in which it grew.

It is a bold little bird, and does not shun observation ; I have sat beside a road and watched it hammering at a small bamboo, not twenty yards from me, for some minutes. I have often noticed this bird hammering away at perfectly sound, green bamboos, and have wondered what they were working at, for though I have examined the places,

where I have watched them tapping, I have totally failed to find any insects. Its flight is quite a typical woodpecker's flight, faster than most, proportionately, and also less dipping. It does not appear to be common either in the plains or at the foot of the hills. Both Mr. Hole and Mr. Inglis, who have favoured me with a list of the *Picidæ* they have met with, report this bird as being rare.

(394) *IYUX TORQUILLA*.—The Wryneck.

Hume, No. 188; Blanford, No. 1003.

A rare bird. I have seen perhaps a dozen in the eight years I have been in Cachar, and have only seen one skin from the plains.

Family *Capitonidæ*.

(395) *MEGALÆMA MARSHALLORUM*.—The Great Indian Barbet.

Hume, No. 191; Blanford, No. 1006.

This is not a common bird here, far less so than it is in Manipur, where Hume says he went after it at least fifty times. I do not suppose I have heard fifty since I came here, and that is now over eight years ago. Its note cannot be better syllablized than it is by Hume, who makes it "pee-yu, pee-yu." The first note is long drawn out, but the second only slightly so.

I have been lucky in finding its nest-hole, but unlucky in finding eggs; three times only have I taken such, and these always hard set, though I have found, or been shown, at least a dozen holes with young in them.

I have only notes regarding the measurements of three eggs which were taken on the 25th of May, 1888, at Gunjong. These measure $1.46'' \times .96''$, $1.45'' \times 1.00''$ and $1.42'' \times .90''$.

The nest was in a tree on the summit of a hill quite near my bungalow, but, though I knew the birds were breeding somewhere near and I hunted hard for the nest, I for a long time failed to find it; twice I thought I had watched one of the old bird's home, and twice the bird flew from the opposite side of the tree, about ten feet up it, as I approached, still I could not make out any nest-hole. The third time, however, I came up with the greatest care, and when within a dozen feet of it, the bird flew off, not from above, as it had always done before, but from about two feet from the roots; and looking here I found the hole just under a bough, which bent over and concealed it.

I have found fully-fledged young in May, so presumably it is an earlier breeder here than in most places, and I think the majority of the Cachar birds breed in April, a few only as late as May.

Its flight appears to me to be like that of most barbets, but stronger and more direct, the dips being both longer and more shallow than they are in the flight of most of the other species.

For many years I had experienced considerable difficulty in obtaining good specimens of this barbet. Those caught on the nest were invariably in bad condition, whilst those I shot seemed equally invariably to get badly knocked about. At last, however, on the promise of a reward of a rupee for each good specimen brought to me, an old Naga volunteered to obtain me some. The following morning he returned with no less than nine, and the next day with yet seven more. Upon this the reward was lowered and the supply ceased, but the old man informed me that at the same price he could daily supply me with numbers. He refused to disclose the manner in which he had caught them, but I was told that it was by means of innumerable small fern-root nooses which he placed amongst the berries which grew on a small kind of *Ficus*, very common in the higher ranges.

(396) CYANOPS ASIATICA.—The Blue-faced Barbet.

Hume, No. 195; Blanford, No. 1012.

This and *C. lineata* are extremely common everywhere, but especially so in all the lower valleys which are fairly well wooded.

Certain birds in these hills are very remarkably coloured, but as gradations of colouring between this and the normal plumage are to be found here, it may be that the coloration is not even of sub-specific value. I give, however, a description of a richly plumaged male, which will show the differences between that and the ordinary bird.

Forehead, metallic crimson; then a narrow line of glossy yellow green, behind which a broad line of black; whole hind crown and nape brilliant crimson-scarlet; lores and supercilium, ear-coverts, chin, cheeks, throat and a part of the upper breast bright pale blue; a black supercilium above the blue one, widening towards the nape; a small, but distinct, spot of crimson-red at the base of the lower mandible, and a patch of the same on each side of the base of the blue throat; between these two patches the breast is green, much mixed with orange; remainder of lower plumage pale greenish, more or less suffused with orange, and

the under tail-coverts splashed with vermillion ; upper back and scapulars dull green, all the feathers suffused with and tipped maroon-red ; lower back and rump green ; upper tail-coverts the same, but broadly edged maroon-red. Tail green, with black shafts to the feathers, and the under-aspect blue ; wing-coverts green, some of the lesser inner ones splashed with maroon ; tertiaries green, strongly suffused with the same ; quills black, the primaries all but the first two, narrowly, and the secondaries broadly, edged with green. During 1895 I paid great attention to this species, and have obtained further information which leads me to believe that this will prove to be a new species which I would, provisionally, name *C. rubescens*. The birds which have the maroon backs, etc., are confined to certain lofty peaks, and the gradations of colour mentioned above are indications of age only, I consider, the young birds being practically identical with those of *C. asiatica*. Adult females will probably be found to resemble the males, but I have not hitherto been able to obtain any.

The common form of *C. asiatica* is to be found all over North Cachar, but is rare on the lofty peaks, where it appears to be replaced by the red species.

I have not found this bird to be the forest-loving species it is generally represented to be : during the breeding season it certainly keeps more exclusively to deep forests than the other barbets do, but at other times I have often seen it quite in the open on single trees or small clumps, and I have also taken its eggs from holes in trees, standing quite by themselves in open grass-covered hills.

I have taken young birds as early as April the 4th, and I have taken eggs as late as June the 24th.

(397) CYANOPS FRANKLINI.—The Golden-throated Barbet.

Hume, No. 196 ; Blanford, No. 1017.

By no means rare in these hills, but very capricious in the localities it affects, and it is hard to say what kind of country it is most partial to. It is very common all over the open oak forest to the north and north-east, but is quite absent over the same forest in the north-west, only to appear again on the heights, everywhere, nearly, covered with dense forest of some kind, on the east. In all the lower valleys it is not to be found with the one exception of the Mahar, where it is not rare on the upper parts.

Its cries are the same as those of the genus *Megalæma*, and bear no resemblance to the notes uttered by *Cyanops asiatica*, *Cyanops lineata*, etc., and I fully believe that it should not be placed in this genus. It is a very plaintive cry and can be heard at long distances, sounding something like "wai-yu," the accent and dwelling being on the second syllable. I have never heard it utter any sound like "kok" (Hume, S. F., Vol. XI., p. 68), which conveys a metallic, resonant impression to the ear, quite unlike the mournful wails which this bird utters.

It does not seem to mind much in what sort of situation it breeds as long as the forest is dense ; but, again like *Megalæma*, its burrows are nearly always short ones, sometimes only entrances made into natural hollows. The nest-hole is made at some height between six and twelve feet from the ground.

They lay three eggs as a rule, sometimes only two and, very rarely, four, and I once took five.

The eggs in my collection measure $1\cdot32'' \times \cdot82''$, $1\cdot32'' \times \cdot78''$ and $1\cdot26'' \times \cdot85''$; another pair $1\cdot14'' \times \cdot82''$ and $1\cdot15'' \times \cdot81''$; and a third pair $1\cdot17'' \times \cdot82''$ and $1\cdot16'' \times \cdot81''$. These are all I have measured, the others I have taken having been given away without my retaining any notes on them.

It is a very shy bird and a very cute one, so that, though so common in some places, it is very hard to get within shot of ; and I have but few specimens in my collection, and of these, all but one were trapped on their eggs.*

Of course, the structure of this bird is not that of the genus *Megalæma*, and if removed from *Cyanops*, a new genus would have to be created for it.

(398) CYANOPS CANICEPS.—Franklin's Green Barbet.

Hume, No. 193 ; Blanford, No. 1008.

A very rare bird indeed, as far as I know, both in Cachar and Sylhet. Hume does not appear to have met with it anywhere up here, but there is a specimen from Manipur in the British Museum. I have had one or two birds sent me up from the plains, and I have seen one in the hills, and *think* I have heard it on one or two other occasions.

* Since writing the above, I have had numerous specimens brought to me, trapped in the manner already described as that in which *M. marshallorum* is snared, p. 352, *ante*.

(399) *CYANOPS LINEATA*.—The Lineated Barbet.*Hume, No. 192; Blanford, No. 1009.*

Even more common than *C. asiatica*.

I have taken a large number of eggs of this barbet, probably more of this one species than all the others put together.

Eighty eggs average $1.20'' \times .92''$. The longest is $1.36''$ and the shortest $1.10''$, the broadest and narrowest are, respectively, $1.03''$ and $.86''$. Typically, I think, the shape is a broad oval, decidedly compressed towards the small end which is rather pointed. All varieties, though, occur, some long regular ovals, others long, but pointed and, more rarely, broad regular ovals.

I have heard this bird labelled as being a bird of one note; now any one who has listened to it *carefully* must admit that it has many. Whilst feeding, it has a large variety of sounds at its disposal. When pleased, it utters a sort of hoarse "chortle"; but to make this sound, it seems to be necessary to be on the move, for it always utters it when hopping from one branch to another, or else it gives a little jerk into the air at the same time that it opens its mouth to give vent to its feelings. Displeasure, which seems to be caused chiefly by seeing other birds feeding with it, is expressed by a ridiculously feeble little sound like "pénch, pénch," the feebleness being made up for, to some extent, by the bird's ferocious attitude as he advances, with drooping wings and mouth wide open, towards the object of his displeasure. The most unusual note is one it makes use of only in the cold weather, at which time these birds sometimes collect in small flocks, and only in the mornings and evenings, seemingly for the purpose of collecting any scattered individuals. It consists of a loud clear whistle, a most wild and penetrating sound, but at the same time rather musical than otherwise. It is an abnormal sort of sound for a barbet to give utterance to, and had I not followed up and shot some of these birds whilst actually whistling thus, I should never have imagined what had made the sound.

(400) *CYANOPS CYANOTIS*.—The Blue-eared Barbet.*Hume, No. 198 Ter.; Blanford, No. 1016.*

Nearly as common all over the district as are *Cyanops asiatica* and *C. lineata*, but it is a smarter little bird, and the nest-hole is not so easy to find.

I have taken the young of this species and brought them up from the time when their eyes were shut to the time when they were fully fledged. I may mention that their eyes do not open for some days.

As a rule, this little barbet lays three eggs, and sometimes only two ; but, on the other hand, it *does* sometimes lay as many as four, as I have taken this number of young. Sometimes when there are four eggs they seem to be laid in pairs, as I once took two hard-set eggs and two young, and, another time, four young birds of two distinct ages.

Twenty-four eggs average $\cdot 96'' \times \cdot 70''$. The greatest length and breadth is $1\cdot 07''$ and $\cdot 83''$ and the least, either way $\cdot 85''$ and $\cdot 65''$. Most eggs are rather long ovals, but others are very broad.

(401) CYANOPS ROBUSTIROSTRIS.—The Thick-billed Barbet.
(*Spec. nov.*)

Whole plumage green, brightest and tinged with yellow on the forehead ; visible portions of the wing rather dull grass-green ; the coverts tinged with yellow on the outer webs ; quills dark brown on the inner webs and next the shaft on the outer webs ; the secondaries edged pale yellow-cream on the inner webs ; tail below dull blue-green. Whole lower plumage rather bright but pale grass-green, the lores, cheeks, ear-coverts, throat and upper breast strongly suffused with blue ; the remainder of the lower parts rather less so, the under tail-coverts being quite free from this colour.

Irides orange-brown ; orbital skin dull blue ; bill horny-black tinged with yellowish-horny at the base ; legs pale slate, claws almost black.

Length $5\cdot 4''$; wing $3\cdot 25''$; tail $1\cdot 70''$; tarsus $\cdot 75''$; bill at front $\cdot 65''$, and from gape $\cdot 98''$, breadth at forehead $\cdot 36''$.

For a long time I considered this bird to be merely a young *C. cyanotis* to which it bears a very strong resemblance, but on getting some nestlings of *C. cyanotis* I was surprised to see the dark forehead very distinctly developed, and these same nestlings, when full grown, had the forehead almost as dark as in the adult bird, although none of the bright colours had begun to show. In these birds the bill and feet were still unmistakably those of very young birds. Comparing my bird with these young ones, I then found other differences were as follows :—

In the first place, my bird, which showed by its feet and bill that it was at least fully adult, had no trace of any dark forehead but, on the

contrary, had this part distinctly brighter than elsewhere. The blue colour is *defined* nowhere, but descends well down the breast.

The rictal bristles are longer and thicker. The bill is shorter than in the adult bird of *C. cyanotis*, but is wider at the base.

The bird is shorter and smaller than an adult *Cyanops cyanotis*, but has a proportionately longer wing and tail.

The most noticeable thing about the bird is the breadth and stoutness of the bill, and from this I have named it.

I have compared it with the birds of the Indian Museum, Calcutta, and here, where there are many skins of both *C. duvacelii* and *C. cyanotis* there is nothing with which it agrees. The late Mr. Oscar Fraser (of the Indian Museum), thinking the bird was a young *C. duvacelii*, tried to prove that such was the case, but admitted that it could not be done.

The bird was one of a large number which were feeding on a *Ficus*, but, unfortunately, as I have already said, was cast on one side as a young *C. cyanotis*, and no trouble was taken to obtain any others.

(402) XANTHOLÆMA HÆMATOCEPHALA.—The Crimson-breasted Barbet.

Hume, No. 197 ; Blanford, No. 1019.

Very common in the plains, but not ascending the hills beyond two or three hundred feet. I have often observed this small barbet, as well as *C. cyanotis*, clambering about a tree like a woodpecker and tap-tapping in the same manner, but it does not do this for the purpose of hunting for insects, but to find a proper place in which to commence its nest-hole, judging, I suppose, from the sound of the taps as to whether the wood is sufficiently soft and rotten for the purpose required.

ORDER—UPUPÆ.

Family *Upupidæ*.

(403) UPUPA EPOPS.—The European Hoopoe.

Hume, No. 254 ; Blanford, No. 1066.

A fairly frequent winter visitant ; one or two birds remaining to breed.

(404) UPUPA INDICA.—The Indian Hoopoe.

Hume, Nos. 254 bis and 255 ; Blanford, No. 1067.

The most common form of Hoopoe in Cachar is, undoubtedly, Oates' *U. longirostris* ; next to this come birds which can be placed neither with *U. ceylonensis* or *U. longirostris* and, finally, there are plenty of birds which

are typical *U. ceylonensis*. The very fact of the two varieties being found in the same small area with many intermediate forms is alone almost sufficient to show that they belong to but one species. This bird is a very early breeder, laying in February and early March, sometimes earlier, for I have found half-fledged young on the 3rd of March. I have, however, taken fresh eggs as late as 24th April.

I have several times watched the cock-bird feeding the female when she is engaged in incubation, still I do not think that, "like the hornbill, she always remains on her nest until the young are hatched."

In fact, I know she does not, for I have watched her *off* the nest and taken the eggs by following her up on her return to it. When beginning to be hard set, however, she does sit very closely on her eggs, and but *seldom* leaves them.

ORDER—TROGONES.

Family Trogonidæ.

(405) HARPACTES ERYTHROCEPHALUS.—The Red-headed Trogan.

Hume, No. 116 ; Blanford, No. 1101.

This is a common bird in suitable localities throughout Cachar up to some 4,000 feet, being most often met with at about 2,000 feet. I have taken a number of nests of this bird, or rather, I should say, a number of eggs, for nests there are none, the bird laying its eggs in some natural hollow of a tree, either on the chips and scraps which have collected in it, or else placing there some half-dozen or so dead leaves. Neither could I be certain that these leaves have been so placed by the birds themselves, for in all the cases where I have seen leaves, the hollows were large and exposed, so that they might easily have been blown into them. The eggs are either three or four in number, most often the former. They range in colour from a very pale buff or *café au lait* to a somewhat warm, rich shade of the same colours. I have seen no eggs wholly white; the very palest in my collection contrast strongly with pigeons' and other *really* white eggs when they are placed alongside one another.

In shape they are often very spherical, but vary a good deal, some being rather long ovals, though both ends are nearly always much the same. The texture is beautifully close and fine, but seldom showing any gloss, and the shell is stout and strong.

They vary in length between $\cdot 99''$ and $1\cdot 29''$, and in breadth between $\cdot 9''$ and $1\cdot 00''$, the average of 39 eggs being $1\cdot 15'' \times \cdot 96''$.

I have one egg $\cdot 99'' \times \cdot 92''$, the most spherical I have seen, and another $1\cdot 24'' \times \cdot 92''$, a remarkably different shape.

I have heard it utter two notes—one a sharp quavering cry not unlike that of a peafowl, though naturally of far less volume; and the other a soft "chuck," which it repeats at long intervals when seated or on the wing in the evenings. It is, however, an extremely silent bird, and one may be years in a place frequented by it without ever hearing its note.

It is very crepuscular in its habits, and avoids sunshine entirely. I have often seen it about up to 10 a.m., but always in very shady places, generally thick bamboo jungle or a shady nullah in deep forest.

It sometimes feeds on the wing very much, in the same manner as do the night-jars, and their flight is like that of those birds, swift and perfectly noiseless; it is never sustained for any time, the bird perching after every swoop for an insect. I have seen them capturing termites and, whilst so engaged, could with difficulty tell them from the night-jars which were also hawking about in some numbers.

ORDER—COLUMBÆ.

Family *Columbidæ*,

Sub-Family *Palumbinæ*.

(406) *ALSOCOMUS PUNICEUS*.—The Purple Wood-pigeon.

Hume, No. 782.

I may here mention that were I not following Oates' classification for the purpose of this Catalogue, I should most certainly have adopted that of Count Salvadori as given in Vol. XXI of the British Museum Catalogue; and this genus *Alsocomus* and also *Palumbus* would have been absorbed in that of *Columba*.

I do not think that *A. puniceus* is a rare bird in certain parts of Cachar, but I have never yet seen it in North Cachar, nor have I seen it more than twice in the plains. Two men, however, who collect for me in the plains have brought me several specimens, and on one occasion brought me the remains of two skins, together with two eggs. They were received by me on the 12th of June, 1889, but had been taken some days before. Not being well blown, they are rather discoloured,

but they do not appear to me ever to have been very glossy. They measure $1.63'' \times 1.25''$ and $1.65'' \times 1.28''$ and seem to be very large compared with the size of the bird. The two nests were said to be rough structures of sticks, which could be seen through, placed in small saplings about a man's height from the ground.

(407) *PALUMBUS PULCHRICOLLIS*.—The Darjeeling Wood-pigeon.

Hume, No. 785.

I have seen but three specimens of this species, all taken on their nests at Hungrum. The only two eggs I have measured are $1.55'' \times 1.15''$ and $1.50'' \times 1.17''$.

The nests were of the common pigeon type, but were lined with a considerable number of feathers. They were placed on small trees in thick forest, one about ten feet from the ground, the other fully twice as high up.

Sub-Family *Turturince*.

(408) *TURTUR MEENA*.—Syke's Turtle Dove.

Hume, No. 793. (*Turtur orientalis*, B. M. Cat., Vol. XXI, p. 403.)

This bird is not common anywhere, and even less so above about 2,000 feet, though it is found as a straggler up to 3,000 or a little over.

The small size of its eggs has already been commented on as compared with those of its very near ally *T. pulchata*, and I have found that this is the case with the eggs of the birds of this district, though I have some which run larger than any mentioned in Hume's "Nests and Eggs;" the largest of mine is $1.37'' \times .97''$.

(409) *TURTUR SURATENSIS*.—The Spotted Dove.

Hume, No. 795.

Extremely common everywhere.

(410) *TURTUR RISORIUS*.—The Indian Ring Dove.

Hume, No. 796. (*Turtur dourica*, B. M. Cat., Vol. XXI, p. 430.)

Very rare indeed. I have seen three or four specimens only in a state of nature, and two or three skins from the plains.

(411) *TURTUR TRANQUEBARICUS*.—The Ruddy Dove. (*Turtur humilis*, B. M. Cat., Vol. XXI, p. 435.)

Hume, No. 797.

Extremely common below 2,000 feet, but does not ascend very much higher. I have taken hundreds of eggs which cannot be distinguished from those of *Turtur meena*, though averaging somewhat larger.

Sub-family *Macropygiinae*.(412) *MACROPYGIA TUSALIA*.—The Bar-tailed Tree Dove.*Hume, No. 791.*

This bird is very common in North Cachar, but not so much so in the plains at any distance from the hills, though during the cold weather it is plentiful all along the foot of the hills, frequenting the mustard fields and other crops. It seems to be a silent bird except during the breeding season, when it is just as noisy as it is quiet at other times. Its call consists of a loud, very deep coo, more like the note of an imperial pigeon than that of a dove.

It breeds in great numbers at and about Hungrum, making a rather stoutly built nest of twigs, sometimes with a rough lining of grass, but most often with none at all. It may be placed on a small sapling only a few feet from the ground or else in a good sized tree as much as thirty feet from it. The males appear to carry on the business of incubation far more than the females, most of the birds I have caught on the nest being of the former sex.

They lay either a single egg or else two, generally the latter. They are of two very distinct types, though intermediate forms may be met with.

The first is a long oval decidedly pointed at one end, though not much compressed, and the second is the normal dove shape, only being of a rather longer oval than usual. The colour ranges from a buff, so pale as to appear white unless contrasted with real white, to a rather warm tint of *café au lait*. Strange to say, the first type of egg mentioned is almost invariably darker than the second.

My eggs are from 1.27" to 1.49" in length and from .90" to 1.05" in breadth.

They lay in May, June and July, sometimes as early as April.

Sub-family *Phapidiinae*.(413) *CHALCOPHAPS INDICA*.—The Emerald Dove.*Hume, No. 798.*

A fairly common bird in suitable localities up to about 2,500 feet, more rare above that height, though I have seen it at Guilang, nearly 4,000 feet up.

Sub-family *Carphopaginæ*.(414) CARPOPHAGA *ÆNEA*.—The green Imperial Pigeon.*Hume, No. 780.*

This bird may be frequently met with nearly all over North Cachar, but nowhere have I met with it in such large flocks as those in which the next bird often collects. It is of course equally plentiful in the plains, where it breeds, as it is higher in the hills, and I have seen it on the very highest of these, though it is most numerous in well wooded valleys at about 2,000 feet elevation.

The size of the plums and berries which these birds swallow is most astonishing. I have taken *jamins* from their crops, some of which I am sure were almost as big as their own heads.

My eggs average $1.90'' \times 1.40''$, but they vary considerably in size, the smallest being only $1.69'' \times 1.29''$ and the biggest $2.03'' \times 1.48''$, nearly all are over $1.85'' \times 1.35''$.

The eggs mentioned in Hume's "Nests and Eggs" (vol. II, p. 367) seem to run much smaller, some being stated to be only $1.6'' \times 1.25''$.

(415) CARPOPHAGA *INSIGNIS*.—The Ruddy-backed Imperial Pigeon.*Hume, No. 781.*

Extremely common in certain localities, but at the same time is not so widely spread as *C. ænea*.

I have taken its nest on several occasions, and do not find that there is any visible difference between that of this bird and that of the species just mentioned. It normally lays but one egg, but I have taken two from the same nest. The average of the eight eggs I have seen of this bird is only $1.82'' \times 1.32''$, decidedly smaller than those of *C. ænea*, although the bird itself is rather the larger of the two.

(416) CARPOPHAGA *GRISEICAPILLA*.—The Grey-headed Imperial Pigeon.*Hume, No. 781 Ter.*

Hume did not find this bird rare in parts of Manipur, but here, in the country adjoining Manipur, I have seen but one typical bird, and this one was a male caught by a Naga on its nest which contained the usual single egg. It measures $1.93'' \times 1.44''$.

The ruddy-backed bird of these hills approaches *C. griseicapilla* in that it has the ear-coverts, cheeks, forehead and anterior crown quite as grey as they are in that bird, but the posterior crown and

upper nape are always vinous, and the breast is never tinged with lilac as it is in that bird. In fact it was this lilac tinge being so strongly developed which first drew my attention to the bird above mentioned, as on first getting it I thought it was only *C. insignis*.

Sub-family *Treroninæ*.

(417) *TRERON NEPALENSIS*.—The Thick-billed Green Pigeon.

Hume, No. 771.

The commonest green pigeon in these hills, and almost equally plentiful in the plains.

Breeds everywhere in suitable places, generally placing its nest in a bamboo clump situated in mixed bamboo and tree forest.

Fifty eggs average $1.10'' \times .82''$, but they grade from $1.02''$ in length to $1.38''$ and from $.78''$ in breadth to $1.00''$. The majority, however, lie between $1.07''$ and $1.15''$ in length, $.80''$ and $.84''$ in breadth. They breed principally in April, very few in March, and equally few as late as June.

(418) *CROCOPUS PHENICOPTERUS*.—The Bengal Green Pigeon.

Hume, No. 772.

I have not met with this species, but there is a specimen in the British Museum from Cachar.

(419) *CROCOPUS VIRIDIFRONS*.—The Yellow-fronted Green Pigeon.

Hume, No. 773 bis.

This is the rarest of the North Cachar green pigeons, and is only, as far as I know, to be found in one or two localities, of which the Mahar valley is the one in which it is most often to be met with, and where a few pairs of birds breed every season.

(420) *OSMOTRERON BISINCTA*.—The Orange-breasted Green Pigeon.

Hume, No. 774.

Spread all over North Cachar and extending well into the plains, it is not, however, anywhere very numerous.

The young male has the orange of the breast well developed by the end of the first year, but the other colours of the breast are not, judging from those young I have seen, shewn until the bird is well advanced into the second year. The nest of this species seems to be about the most primitive of all pigeons' nests. I have seen some which it

would appear ridiculous to suppose capable of supporting a young brood and how they *do* succeed in so doing I cannot understand. I took one nest in 1893 in which I do not think there were more than about a score of twigs used and gaps shewed through the nest fully half an inch in diameter, only just small enough not to allow of the eggs falling through.

Although the bird is one of the largest of this genus, its eggs are very little, if any, larger on an average than those of *O. phayrii*, etc., measuring about 1.1" by .89". They are broad, very regular ovals and intensely glossy, almost like a kingfisher's eggs in this respect.

(421) OSMOTRERON PHAYRII.—Phayre's Green Pigeon.

Hume, No. 776.

Not as common as *Treron nepalensis*; still to be met with in considerable numbers everywhere below 3,000 feet.

The eggs and nests do not differ at all from those of *Treron*; and like those of that bird the latter are placed either in bamboo clumps, high bushes or low saplings.

(422) SPHENOCERCUS SPHENURUS.—The Wedge-tailed Green Pigeon.

Hume, No. 778.

This bird is present in considerable numbers throughout North Cachar at all levels and, during the breeding season, from 2,000 feet upwards. It certainly does not perform here either immigrations or emigrations beyond the very partial one of working higher up as the breeding season approaches. Nor do I think it is more numerous during the cold weather than it is during the hot weather and rains, so that it would appear that if, as Hutton thinks must be the case, the Western birds migrate East, then they must go elsewhere than to Cachar, where the number remains stationary. My eggs average 1.24" \times .90".

(423) SPHENOCERCUS APICAUDUS.—The Pin-tailed Green Pigeon.

Hume, No. 779.

More common a good deal than *S. sphenurus*, and inhabiting much the same range, though it is found lower during the breeding season.

Its nest is the usual one made by pigeons, and there is nothing to remark about it.

The eggs average 1.30" \times .94" and vary in length between 1.09" and 1.37", and in breadth between .87" and 1.02".

Their nests are generally built in rather heavy forest, never in bamboo clumps, seldom on bushes, generally on young saplings at a height of about 15 or 20 feet from the ground.

It is extremely common at Guilang, about 3,500 feet elevation, during the breeding season. Males do more of the incubation than do the females.

ORDER—CUCULI.

Family *Cuculidæ*.

Sub-family *Cuculince*.

(424) *CUCULUS CANORUS*.—The European Cuckoo.

Hume, No. 199 ; Blanford, No. 1104.

Fairly common.

I have a very poor collection of skins of the *Cuculidæ* and have been very unfortunate concerning these birds in every way, principally in taking a great number of eggs, cuckoos undoubtedly and *probably* belonging to certain species, but the greater number of which cannot be assigned to any one particular species with *absolute* certainty.

(425) *CUCULUS INTERMEDIUS*.—The Asiatic Cuckoo.

Hume, No. 200 ; Blanford, No. 1105.

I have an egg taken from a nest of *Suya crinigera*, which also contained three *Suya*'s eggs, which I believe to belong to this bird, the proof being that a female of *C. intermedius* was shot that day near the nest, and though I was at Haflang for some days prior to taking the nest I saw no other *Cuculus*, nor did I see any after shooting the one in question.

The egg is a queer pale purplish stone-colour as far as the ground-colour goes, the secondary markings consisting of darker and bluer smears and blotches of the same colour, and the primary specks and blotches being of various shades of brown. The egg can be matched with many of *C. canorus*. This is not a very common bird here, and I have shot more European than Asiatic cuckoos in Cachar.

(426) *CUCULUS MICROPTIRUS*.—Gould's Cuckoo.

Hume, No. 203 ; Blanford, No. 1107.

I have two specimens of this, both males in perfect plumage. One was shot in the plains, the other at an elevation of about 3,500 feet.

(427) *HIEROCOCCYX VARIUS*.—The Common Hawk-Cuckoo.*Hume, No. 205 ; Blandford, No. 1109.*

I have but one specimen of this bird, a very young male, with heavy, broad, rufous striations to the whole of the lower plumage. Besides this I have seen four or five others only, and, of these, one was shot, so the collector informed me, as it flew off a nest. This nest is, I think, that of a fly-catcher of sorts, but there were no eggs in it other than the one which was said to be the egg of the cuckoo.

In colour it is a clear, bright, but not very pale blue, and is in shape a broad almost perfect oval. It measures $1\cdot07'' \times 82''$.

(428) *HIEROCOCCYX NISICOLOR*.—Hodgson's Hawk-Cuckoo.*Hume, No. 206. (H. fugax, B. M. Cat., vol. xix, p. 236).**Blandford, No. 1110.*

I have seen several specimens of this hawk-cuckoo, and in 1891 obtained an egg which really would seem to belong to it although so utterly different from what would be expected.

I was hunting for the nest of a pair of *Orthotomus coronatus* at the time, when a cuckoo flew from out of a tuft of grass about twenty feet from me. I, of course, shot her, and before even picking her up went to the tuft whence she flew and there found a nest of *Stachyridopsis* containing two of its proper eggs and a third, much larger than the two others put together. I then went for the cuckoo, which I found to be *H. nisicolor*.

The egg is a pale bright olive-brown, with the olive tinge very strong, and in shape is a very perfect long oval. There is the faintest possible sign of a cap of a darker hue at the extremity of the larger end. This egg is $\cdot96'' \times 63''$. A second egg was got by a European taxidermist of mine who took it from the nest of a small *Niltava*. He informed me that he had distinctly seen the bird get off the nest, and that he then shot it.

The egg is very like the one just described, but is a darker brown, less olive, and measures only $\cdot87'' \times 64''$.

I must add, however, that this same taxidermist was quite the most fluent liar I have ever met, and that though his story is *probable*, and it is true that he did bring home this egg and a bird of this species on

the same day, I place very little reliance on his assertion that he saw the bird leave the nest.

These eggs seem to be exactly like the one taken by Mandelli from the oviduct of a female, yet I feel dissatisfied with them and am sure they ought to be blue. The notes collected by Hume on the nidification of these hawk-cuckoos is fearfully conflicting, and I am afraid my notes will only add to the confusion.

It seems utterly improbable that *H. sparveroides*, *H. nisicolor*, and *H. varius* should lay different coloured eggs, yet, so far the evidence is, Major Bingham took a blue egg from the oviduct of *H. varius*, Mandelli took one coloured olive-brown from the oviduct of an *H. nisicolor*, and Mr. Davison saw *H. sparveroides* build a nest and lay a white egg, whilst Miss Cockburn is equally positive that she took two nests, but the eggs were white marked with brown.

(429) *HIEROCOCCYX SPARVEROIDES*.—The Large Hawk-Cuckoo.

Hume, No. 207 ; Blanford, No. 1109.

Here again my evidence as to eggs is most meagre. I have one egg taken from the nest of a *Pellorneum* which is supposed to belong to this bird, because a female was shot near the nest. This is of the same type as the last two, but a good deal darker than they and also a more pointed oval. It measures 1.02" x .72"

(430) *CACOMANTIS MERULINUS*.—The Rufous-bellied Cuckoo.

Jerdon, No. 209 ; Blanford, No. 1113.

Hume says that he found the bird very common in Cachar. I have not found it so in North Cachar, but have received a large number from the plains.

(431) *SURNICULUS LUGUBRIS*.—The Drongo Cuckoo.

Hume, No. 210 ; Blanford, No. 1117.

I have seen but three specimens of this handsome little cuckoo, all three shot by Mr. Inglis in 1894 near Silchar itself.

(432) *CHALCOCOCCYX MACULATUS*.—The Emerald Cuckoo.

Hume, No. 211 ; Blanford, No. 1116.

Here at last my evidence on the oology of a cuckoo is fairly complete.

I had received other eggs before and on very fair evidence, but at last I was to have some of a sort not very likely to be beaten. A Naga

found a nest of *Stackyris nigriceps*, and in accordance with his usual custom set a hair noose at the entrance of the nest and went away. Returning an hour or so afterwards he found a female Emerald Cuckoo still alive in the noose, which was one made with an extra long mithna hair. On examining the nest I was delighted to find that in addition to the two white eggs it originally contained there was a third of a very different character.

This is an egg with a very pale pinkish-cream ground, and is blotched rather profusely with pale neutral tint and greyish-pink and, less freely, with spots and short lines of rather dark reddish-brown. There is no definite cap or zone, but the markings are more numerous and more confluent at the larger end. The shape is a blunt oval, somewhat compressed towards the smaller end. The shell is very fine, rather fragile, and has a slight gloss. It measures $\cdot 78'' \times \cdot 62''$. Another egg very similar, but less marked, sent me by Mr. Hole from Jellalpur, was found in a nest of *Turdinus abbotti* which also contained two eggs of the rightful owner. This egg is $\cdot 82'' \times \cdot 60''$.

A third egg I took myself from the nest of a common tailor-bird at Gunjong. When first found it had two tailor-bird's eggs in it as well as the cuckoo's, but I waited a day and the owner of the nest laid another egg. I shot an emerald cuckoo, in the same piece of jungle, but nowhere near the nest, the following day to that on which it was found. I am satisfied as to the ownership of the cuckoo's egg, as there is no other small cuckoo here which could have laid it, the eggs of the genus *Cacomantis* being so totally different. This third egg is more minutely speckled than either of the others, but is of the same colour and shape. It is $\cdot 78'' \times \cdot 63''$. I have had other eggs sent me from Cachar as being the eggs either of this or the next species, and these agree well with those already described.

The bird is very rare in North Cachar, but is almost common in the plains at certain seasons. Mr. Hole had a lovely series, of both this and the following species, collected at Jellalpur.

(433) *CHALCOCOCYX XANTHORHYNCHUS*.—The Amethyst Cuckoo.

Hume, No. 211 bis; Blanford, No. 1115.

I have not a single specimen of this bird in my collection, and it is very rare in the Hills, although quite the contrary in certain portions of the plains.

(434) COCCYSTES JACOBINUS.—The Pied-crested Cuckoo.

Hume, No. 212; Blanford, No. 1118.

A rare bird everywhere, but I have been rather lucky in taking two eggs of this bird, both of which I believe to be authentic.

In both cases the egg was in a nest of *Alceippe nepalensis*, and in both cases I disturbed the bird, in one case shooting it.

The two eggs measure $1.00'' \times .90''$ and $.99'' \times .79''$, both being rather larger than most eggs of this species, and had I not got one of the birds and that one the layer of the larger egg of these two, I should have been rather doubtful about them.

(435) COCCYSTES CORAMANDUS.—The Red-winged Crested Cuckoo.

Hume, No. 213; Blanford, No. 1119.

This form is somewhat more common than the last in the hill portion of the district, less so in the plains portion.

I have been most lucky in obtaining eggs of this species, and have now six authentic eggs in my own collection besides others which I have given away.

My eggs are as follows:—

1st. An egg taken from a nest of *Garrulax moniliger* which contained three *Garrulax* eggs, one of which was broken by the cuckoo in its struggles to escape.

The cuckoo's egg is of a most beautiful soft blue-green colour, not unlike that of the Laughing-thrush's eggs themselves, but the texture is utterly different, being extremely fine, close, and of a satiny texture like that of the eggs of the *Capitonidæ*. There is a very faint gloss. The shape of the egg is very spherical, and it measures $1.13'' \times 1.00''$.

2nd. The second, which was found in an empty nest of *G. pectoralis*, only differs in being smaller, $1.05'' \times .81''$.

3rd. This was in a nest of *G. moniliger* and measures $1.12'' \times .90''$.

4th and 5th. Again in a nest of *G. moniliger* with three eggs of that bird and two of the cuckoo's, which bird was shot as it got off the nest. Of these two eggs one was congealed and bad, impossible even to blow, and the other was quite fresh. They measure $1.09'' \times .92''$ and $1.04'' \times .87''$.

6th. This, the only egg not taken from the nest of a *Garrulax*, was found in that of *Copsychus saularis*; the female was shot by a Cachari with slugs, and smashed all to pieces, and an egg just ready to be laid

was also smashed, so I cannot say whether the other was laid by her or not. It measures $1.05'' \times .90''$.

All these eggs are identical in shape, colour and texture, differing only in size.

They were taken on the dates given below:—

31st May, 1890, 17th May, 1892, 17th June, 1892, 30th May, 1892, and 1st June, 1892, in the order in which they are described.

In May and June, 1892, I must have seen fully four times as many birds as I have seen in the other seven years that I have lived in Cachar.

(436) *EUDYNAMIS HONORATA*.—The Indian Cœl.

Hume, No. 214; *Blanford*, No. 1120.

The common form here is the Malayan type. It is, of course, very numerous in the plains, but does not ascend the hills to any height.

Sub-Family *Phœnicophæne*.

(437) *RHOPODYTES TRISTIS*.—The Large Green-billed Malkoha.

Hume, No. 215; *Blanford*, No. 1123.

Very common up to about 3,000 feet.

This is a very familiar bird in these hills, and I have even seen it enter my compound. I never saw it feed on the wing until a few days ago, when, as I was walking along a forest path, one of these birds flew out of the bushes by the side and chased a large grasshopper, which passed by it, eventually catching it when within a yard or two of my feet.

The eggs vary enormously in size, *viz.*, from $1.24''$ to $1.68''$ in length and from $.86''$ to $1.17''$ in breadth.

The average of forty is $1.46'' \times 1.03''$.

They generally lay three eggs, sometimes only two.

Sub-Family *Centropodince*.

(438) *CENTROCOCCYX INTERMEDIUS*.—The Burmese Coucal.

Hume, No. 217 *quat*; *Blanford*, No. 1130.

The birds obtained in Cachar are nearer this form than any other, but it is quite impossible to discriminate between them properly, even Hume, the great splitter-up of the coucals, calls the Manipur form (the same as this) neither true *C. intermedius* or true *C. rufipennis*, and so throughout, the different forms all blend one into another, and the variations at their highest value can be but subspecific.

It is fairly common, but not exceedingly so, in the plains of Cachar, and almost rare in the hills, where, instead of being the "every day familiar" bird it is in Bengal, it is as shy and wild as possible.*

(439) *CENTROCOCCYX BENGALENSIS*.—The Lesser Coucal.

Hume, No. 218; Blanford, No. 1133.

There are two distinct sizes of this bird in Cachar, both inhabiting exactly the same places.

One of these is of the largest size, the total length averaging 16 inches, and the wing a little over seven.

The smaller form averages not more than 12 inches, and has the wing only 5·5". I have seen no intermediate forms, but as yet have too small a series to make any assertions about them.

(440) *TACCOCUA LESCHENAULTI*.—The Bengal Sirkeer.

Hume, No. 220; Blanford, No. 1129.

This was a bird I was much surprised to see up here, but in the hills it seems as common as, or not more rare than, the last bird. I have not received any notice of it from the plains, and it does not seem to occur there.

* Since writing the above, I see that Blanford has joined *rufipennis*, *maximus*, *intermedius* and *sinensis* under the one name of *sinensis*, a conclusion in which I most heartily concur, so that this bird will now stand as *Centropus sinensis*.

THE BUTTERFLIES OF THE NORTH CANARA DISTRICT
OF THE BOMBAY PRESIDENCY.

BY J. DAVIDSON, T. R. BELL, AND E. H. AITKEN.

PART II.

(With Plates IV and V.)

(Continued from page 259, Vol. X.)

Family LYCENIDÆ.

This large family of butterflies is very numerous in Canara, and we have succeeded in obtaining the following :—

70. *Neopithecops zalmora*, Butler. (No. 641 of de Nicéville.)

This is common everywhere, both above and below the ghâts, in and near evergreen forests and wherever its food-plant occurs. We have found it at all seasons.

Its larva is of the usual woodlouse form common among the “blues.” It is of a rough texture, with the segments well defined, pubose under the lens; the head concealed and the sides flattened; colour a bright apple-green, with a faint darker line along the middle of the back.

It feeds on *Glycosmis pentaphylla*, Correa, and the pupa is attached to the leaf, parallel to it; the thoracic part is narrow and contracted, and the abdominal rounded, and considerably higher than the thorax.

It is of a bright green, with a darker dorsal line, and a similar line forming the boundary of the abdominal segments. It has a row of minute dark spots along these lines. We have taken the larvæ in Karwar throughout the rains, and no doubt this species breeds throughout the year.

71. *Spalgis epius*, Westwood. (No. 642 of de Nicéville.)

This is a distinctly local butterfly, but fairly common where it occurs. We have taken it often at Karwar, and abundantly north of Karwar along the Goa frontier. Elsewhere where we have been it cannot be common.

Its early stages and carnivorous habits were fully described at page 485 of Vol. VIII of the Journal.

72. *Megisba malaya*, Horsfield. (No. 645 of de Nicéville.)

This insect we consider rare, and have only taken a very few specimens, almost all on the line of the gháts in the south of the District or at Karwar. We have never reared the larva.

73. *Chilades trochilus*, Freyer. (No. 673 of de Nicéville.)

This, the smallest butterfly we know, is common along the coast, in open grass country. We have only taken it in the cold weather, and it does not seem to appear till the very end of the rains.

74. *Cyaniris pupa*, Horsfield. (No. 681 of de Nicéville.)

This butterfly is common at the beginning of the rains and again towards its close, and throughout the cold weather. The rains form differs much from that of the cold weather, the markings on the underside being very much more pronounced.

The larva is of the woodlouse form, but not flattened, the ridge being well defined. It looks smooth, but under a microscope is seen to be covered with short white hair. Its colour is green, with a pink longitudinal band along the centre of the back which gradually becomes narrower and disappears as it reaches the tail. The sides are also strongly suffused with pink, the colour of the young leaves of the Jamba (*Xylia dolabriformis*, Benth.), on which it generally feeds. It may be noted that it also feeds on *Cylista scariosa*.

The pupa is short and stout, the thoracic and abdominal portions being about the same height. Its colour varies with its situation, but is generally a brownish-white, much mottled with darker brown, and with a darker band along the thorax, extending along the centre of the abdomen. It is smooth and not covered with hair.

75. *Cyaniris limbatus*, Moore. (No. 693.)

This is a very common species in the cold weather in the south of the District. We have, however, only found it in the neighbourhood of the gháts there, and have not noticed it elsewhere.

76. *Zizera lysimon*, Hübner. (No. 699.)

Common from September onwards along the coast among short grass. The larva, which feeds on a small vetch (*Zornia diphylla*), is of the usual form, but narrow, and is not attended by ants; it is covered with minute light coloured hairs. Colour grass-green, with a lighter marginal line.

The pupa is of the usual form, narrow, green, with a slightly darker line dorsally, and with brown edges to the wing-covers.

77. *Zizera gaika*, Trimen. (No. 702.)

This is a common species in long grass and in scrubby jungle, all along the coast during the cold weather. It is also found commonly above the gháts in similar places. We have bred the larva commonly above the gháts on the flowers of *Nelsonia*. It was of the usual woodlouse form, but narrower than *Z. lysimon*, Hübnér; segments well marked and covered with dense black bristles; colour transparent green with a subdorsal white stripe, and a red dorsal blotch on each segment. Pupa green, very slender, thickest in the centre, anal end very narrow, rounded; thorax only slightly humped, covered with thin, longish, white hairs.

78. *Zizera otis*, Fabricius. (No. 703.)

This is another species found in the cold weather in great numbers in similar places to *Z. lysimon*, Hübnér. We have never found the larva.

79. *Lycænesthes emolus*, Godart. (No. 711.)

This butterfly is fairly generally distributed above and below the gháts, but, as far as we have been able to judge, is only found near water, and is very local. We have taken it commonly in one locality near Karwar in the early rains, also in the Kumta taluka, and in the Supa petta. We reared considerable numbers of the larvæ. They are very similar in shape and marking to *Arhopala* described hereafter, but with a small shiny green head. The colour is dark rose, or grass-green, the margins of the second and anal segments being slightly hairy, segments corrugated on the sides.

The pupa is of the ordinary lycænid shape, largest and thickest at the thorax, anal segment hoof-shaped. The colour varies from dusky pink to grass-green; on the back of the thorax there is a light diamond-shaped mark. The larva feeds on *Saraca indica* and on *Combretum extensum*, and is looked after by red ants. Both larvæ and pupæ are gregarious.

80. *Lycænesthes lycænina*, Felder. (No. 712.)

This species is less common than the last, and we have only found it in the Siddapur taluka, along the 18 miles of road from the river at old Gairsoppa to the famous falls of the same name, and at Ulvi in the Supa petta.

81. *Talicaða nyseus*, Guérin. (No. 715.)

This species is very common among gardens, both above the gháts and on the coast, and seems never to make any lengthy flights from the neighbourhood of its food-plant, *Bryophyllum calycinum*. It is found at all seasons, but is specially abundant in the hot weather. The larva is onisciform, but much rounded, and with the segments at the divisions very clearly defined, head small, almost concealed; last segment flattened. It is in colour fleshy-white, with a row of nine small black dots along the back on each side, and a ring of four similar dots on the segment nearest the head; it is profusely covered with small white hairs. It feeds in the interior of the fleshy leaves of *Bryophyllum calycinum*, only emerging in order to turn into a pupa. This latter much resembles the larva, being short and blunt, and covered with short white hair. It is of the same fleshy colour as the larva, and has two lines of small black dots along the surface of the abdomen continued along the thorax. It also has a third row of four similar dots on the middle of the abdomen between them; the two dots on the thorax nearest the head are also connected by two other dots. The larva and pupa are figured on Plate IV, figures 1 and 1a.

82. *Everes argiades*, Pallas. (No. 716).

We have obtained one specimen of this in the Supa petta. It was bred among some larvæ of *Catochrysops*, and was not discriminated at the time.

83. *Nacaduba macrophthalma*, Felder. (No. 719.)

The *Nacadubas* are difficult to discriminate, and are no doubt often mistaken for one another, and as they are very common it is impossible to slaughter every one seen in the hope of its turning out one of the rarer species.

This species we have only taken near the Falls at Gairsoppa, and in the neighbourhood of Siddapur, twelve miles off. All were taken in December and January.

84. *Nacaduba hermas*, Felder=*viola*, Moore. (No. 722.)

This butterfly, the male of which can easily be known by its sharply pointed forewing, we have only taken near Karwar. All the males were obtained during the rains, while basking on "karwi" on the tops of the hills. We also procured two females near the coast at Karwar. On the underside the ground-colour is a very rich chestnut.

85. *Nacaduba noreia*, Felder=*ardates*, Moore. (Nos. 724 & 730.)

This butterfly, here always tailed, is very common near Karwar. The underside of the male is grey, while that of the female is rich fawn. We have reared many larvæ on the flowers of *Acacia cæsia*. They resemble those of *N. atrata*, Horsfield (described below), the segments being very distinctly marked, but differ in being much smaller, and having the hinder margin of each segment dorsally bordered broadly by bright yellow. The pupa is indistinguishable except by size from that of *N. atrata*.

86. *Nacaduba plumbeomicans*, Wood-Mason & de Nicéville. (No. 727.)

This butterfly, which resembles a small washed-out *N. atrata*, Horsfield, is fairly common in Karwar.

We have bred it on *Wagatea spicata* only. The larva is also similarly shaped to that of *N. atrata*, but the segments are not so clearly defined. It is pale green with a dark or reddish line on the back, and a faint yellowish line on each side. The pupa differs from *N. atrata* by being narrower, and the markings not so well defined.

87. *Nacaduba atrata*, Horsfield. (No. 725.)

This is the commonest of the small blues in the district, and is found at all seasons and everywhere. Its larva, which feeds on *Embelia robusta*, is of the usual woodlouse form; the back is elevated, and the segments most distinctly defined; the anal segment is flattened; the back forms a distinct ridge; the colour is green, but there is a purple line along the ridge of the back; the other segments are also edged with the same colour. The head is small, amber-coloured, with a darker border.

The pupa is short and stout, constricted slightly between the thorax and abdomen, and has slight traces of a ridge along the back. In colour it is a dingy greenish-brown, powdered with black. There is an interrupted dark band along the middle of the back, and also spots of blackish on the abdominal segments and just beyond the wing covers and on the sides of the thorax. It is smooth and only fastened at the tail, parallel with the leaf to which it is attached. The larva and pupa appear on Plate IV, figures 2 and 2a.

88. *Nacaduba dana*, de Nicéville. (No. 731.)

We have only taken a few of this butterfly, and all, the localities of which we have recorded, were from the Siddapur taluka, in the south of the district above the gháts, or from the Supa petta.

89. *Jamides bochus*, Cramer. (No. 733.)

This is one of the most local *Lycenidæ* in the district, but we have occasionally taken it both above and below the gháts.

The larva, which we have taken at Karwar in June, is hardly distinguishable from that of *Catochrysops pandava*, Horsfield; it is, however, covered with minute hairs, and is generally of an olive-green colour and without the reddish suffusion so generally noticed in *C. pandava*. The pupa is indistinguishable from that of *C. pandava*. The larva feeds on *Xylia dolabriformis*, and also on the flowers of *Butea frondosa*.

90. *Lampides elpis*, Godart. (No. 734.)

Fairly common both above and below the gháts, wherever there are evergreen jungles or gardens planted with cardamoms

The larva feeds on the flowers and seeds of the cultivated cardamom, and also on those of *Kampferia pandurata*. It is very similar to that of *L. celeno*, Cramer, but is, of a pink hue, with well-defined stripes of red dorsally and laterally.

The pupa, which is formed inside the fruit, or in the cluster of dead flowers above the fruit, is smooth and of a dull yellowish-brown, marked with interrupted dorsal bands of a darker brown. In shape it is similar to *L. celeno*.

91. *Lampides celeno*, Cramer = *ælianus*, Fabricius. (No. 738.)

A very common butterfly everywhere in Canara. The larva, which generally feeds on the *Kurunj* (*Pongamia glabra*), but which we have also found feeding on the flowers and in the pods of *Abrus precatorius*, has been fully described in Mr. de Nicéville's "Butterflies of India," vol. iii, at page 161. The pupa is of the ordinary shape of the small blues, and is quite smooth.

92. *Catochrysops strabo*, Fabricius. (No. 743.)

A common butterfly in the cold weather above the gháts, and locally along the coast. We have not obtained it at Karwar in the rains.

We have reared the larva on the flowers of *Ougeinia dalbergioides*, and on *Schleichera trijuga*. They are of the usual shape, head light

yellow, margined with brown ; body light rose, covered with tiny star-topped stems, so arranged as to make diagonal whitish lines to each segment ; a subdorsal line on the back ; anal segment nearly square ; the margin of the body clothed with light-coloured and longish hair.

Pupa of the usual form, covered with stiff erect hair ; colour light rose, with a black patch on the second segment and centre of thorax ; it has also a dark dorsal line, and the lower segments are smudged with black.

93. *Catochrysops cnejus*, Fabricius. (No. 745.)

This butterfly we have found in similar places and times to *Catochrysops strabo*, Fabricius, but it is hardly as common.

The larvæ and pupæ we have found indistinguishable from the last, and on the same plants.

94. *Catochrysops pandava*, Horsfield. (No. 750.)

One of the commonest butterflies in Karwar during the rains, and noticed at other seasons. Its larvæ may be found any month from May to November, and probably at all other seasons when its food plants have young shoots. Its commonest food is the *jamba* (*Xylia dolabriformis*), but we have occasionally taken it on *Wagatea spicata*. The larva is of the usual woodlouse form, smooth, and much flattened underneath ; it is usually of a darkish green, with a broad dorsal band, narrowing towards the head ; the sides have a number of faint oblique pinkish lines ; the head is small and dark green. It is attended by ants.

The pupa much resembles that of *L. celeno*, Cramer, but is smaller, much narrower, and less flattened ; it is of a darkish green as a rule, with a darker dorsal band.

95. *Tarucus theophrastus*, Fabricius. (No. 752.)

Is a rare butterfly in Canara, a few only being seen in the cold weather in the east of the district and along the opener portions of the coast.

The form we get here is the very small one which has been separated as *T. nara*, Kollar.

We have reared this in Bombay on *Zizyphus jujuba*, as mentioned in our former paper.

96. *Tarucus plinius*, Fabricius. (No. 758.)

Also an uncommon butterfly in Canara. We took two or three specimens in June on the top of a hill near Karwar. These are the only specimens of which we have records.

97. *Castalius rosimon*, Fabricius. (No. 759.)

This is fairly common throughout the year, but much more so in the cold weather. Its larva, which feeds on *Ziziphus jujuba*, is of a rough texture, as if shagreened all over. It is of the usual woodlouse form, much flattened towards the anal segment, which is very broad; head concealed; colour bright green, with a double, dorsal, yellow line, and the sides powdered with small yellow spots.

The pupa is fastened by the tail along a leaf horizontally (the band across the thorax being very lax). It is much contracted at the thorax, while the abdominal portion is large and rounded, and much higher than the thorax. It is of a bright green, with faint yellow bands on the abdomen and two or three black spots there. It also shows traces of a darker band in the centre of the abdomen.

98. *Castalius ananda*, de Nicéville. (No. 760.)

A very local butterfly, but common where it occurs. We have taken it abundantly on the coast North of Karwar near the Goa frontier, in various other places in the opener jungles below the ghâts, and also along the ridge of the ghâts.

The larva, which like that of *C. rosimon*, Fabricius, feeds only on the *parenchyma* of the leaf, is of the usual woodlouse form, slightly flattened; head concealed in the second segment; surface more or less rough; a fringe of long white bristles all round, with an erected ridge of similar bristles along the back from the 2nd segment; those on the 3rd to 7th segments, and the last two much longer than the others; those on the 2nd segment very few, short and black. It has a conspicuous gland on the 12th segment, and is attended by a small species of ant of the genus *Cremastogaster*. Its colour is pale green, the dorsal portion of the 2nd, 4th, 5th, 6th, and last two segments being park brown, while the centre segments are almost yellow with a darker dorsal line. We found it feeding on *Zizyphus xylopyrus*, and also on *Loranthus*, where it was also attended by *Cremastogaster* ants.

The pupa is of the usual *Castalius* form, but narrow and slightly flattened. It is intensely glossy, as if covered with gum. It varies in colour, being sometimes black, at others green with inconstant black markings. The larva and pupa are figured on Plate IV, figures 3 and 3a.

99. *Castalius ethion*, Doubleday and Hewitson. (No. 761.)

This is a local little butterfly, found in particular limited localities all over the district, and noticed at all seasons.

The caterpillar, which feeds on young shoots of *Zizyphus jujuba*, is of the woodlouse form, but flattened. Its texture, though apparently smooth, is, if looked at with a lens, found to be thickly covered with white hairs; its colour is greenish-white with a faint, green, dorsal band.

The pupa is similar in shape to that of *C. rosimon*, Fabricius, but smaller and narrower. It is of a bright apple green, with a darkish green line down the centre. There are some small red dots on the edges of the wing-cases. The larva and pupa are figured on Plate IV, figures 4 and 4a.

100. *Castalius decidia*, Hewitson. (No. 766.)

This is the commonest species of the genus, and its larva and pupa were described in our former paper. It feeds on *Zizyphus rugosa*, and may be known from that of *C. ethion*, Doubleday and Hewitson, by having two green bands on the back instead of one. The butterfly is common everywhere at all seasons.

101. *Polyommatus bæticus*, Linnæus. (No. 767.)

Fairly common above the ghâts in the cold and hot weather, and possibly so in the rains. Below, in the cold weather, sparingly found in places on the immediate coast. We have not noticed it during the rains. The larva feeds on the buds of *Toor* (*Cajanus indicus*), and fields of that grain swarm with the butterfly in February. We also got great numbers of larvæ on *Butea frondosa*. They were of the usual form, but much corrugated: head yellow with a black cheek spot, margin fringed with short hairs, anal portion rounded; colour obscure yellow.

Pupa almost similar to that of *Catochrysops pandava*, Horsfield, but more rounded; it is formed loosely on the ground, or in some cases under a clod, the larva falling with the withering flower.

102. *Amblypodia anita*, Hewitson. (No. 771.)

A common butterfly in the hot weather and in the earlier half of the rains wherever there is evergreen jungle. Also occasionally noticed during the cold weather. The caterpillar is a very striking object. It is of the woodlouse form and large for the size of the butterfly.

the segments are well defined, giving the back and sides a serrated outline ; the colour is an oily yellow with a broad, dorsal, electric blue line (a colour it is impossible to paint), not extending to the last segment, a subdorsal line on each side of a similar colour, but narrower, and not extending to the last two segments, and a similar lateral narrower line : head small and of a clear transparent brown devoid of markings. The second segment projects and is cloven in the middle, acting as a shield to the head ; the legs, feet, and lower parts are yellowish-green. It feeds on young shoots of *Olax scandens*, Rox.

The pupa is thick, broad, and of a rough texture ; it has no protuberances, and is fixed by the tail (which is short and broad) along a leaf, the thoracic band being very fine ; in colour it is of a whitish-brown, slightly tinged with purple. It has two faint, interrupted bands extending from the tail obliquely to the thorax ; it is also mottled with brown round the thorax. The larva and pupa appear on Plate IV, figures 5 and 5a.

103. *Iraota timoleon*, Stoll. (No. 775.)

A common butterfly at Karwar, and along the coast as far south as Kumta. Elsewhere we have no record of having observed it. We have taken it at all seasons, it being most decidedly one of the "basking" blues. The larva, which feeds on young shoots of the various fig-trees, has been described, with the pupa, in our former paper. We figure them now on Plate IV, figures 6 and 6a.

104. *Surendra quercetorum*, Moore. (No. 778.)

This is a rare butterfly everywhere. We have taken it in Karwar during the rains, and at Gairsoppa and Kutgal, both jungly places below the gháts. Above the gháts in the Supa petta it is also sparsely distributed.

Larva onisciform, anal segments flattened ; slightly ridged along the back ; head concealed by a plate, which is distinctly separated from the next segment, colour light green, with a broad pink band in the middle of the back, centered by a dark green line, a pink lateral band above the legs on each side, the sides banded obliquely with alternate bands of very light and dark green. It feeds on the young thorny shoots of *Acacia pennata*, Willd.

Pupa fastened only by the tail, short and stout, with the head slightly pointed and the thorax higher than the abdomen ; it is of an almost

uniform dark brown. The larva and pupa are figured on Plate IV, figures 7 and 7a.

105. *Thaduka multicaudata*, Moore. (No. 785.)

This butterfly we have found in December and January, and also in April, at one place only, along the road from the village of Nagarbustikeri to Malemane. This is the road travellers to the Falls on the Gairsoppa river have to traverse. We have only taken seven specimens in all, though a good deal of time has been expended on searching for them.

106. *Arhopala centaurus*, Fabricius. (No. 786.)

A very common butterfly all over Canara during the end of the hot weather and the early portion of the rains, and occasionally at all other seasons.

The larva was fully described in our former paper (page 354 of Vol. V). We have found it on *Hopea*, *Terminalia paniculata*, *Xylia dolabriformis*, and *Lagerstræmia microcarpa*, Wgt. The larva and pupa are figured on Plate IV, figures 8 and 8a.

107. *Arhopala amantes*, Hewitson. (No. 791.)

Equally or more common than *A. centaurus*, Fabricius, and found at the same seasons. The larva, which feeds on the same plants, is very similar, but differs in the hairs being longer. It is a much paler caterpillar, the 4th and 5th segments and the 10th having the back a clear chrome-yellow instead of brown. It is usually attended by masses of red ants. It is figured at No. 9 on Plate IV. The pupa is so similar to that of *A. centaurus* that differences can only be discovered by microscopic examination.

108. *Arhopala abseus*, Hewitson. (No. 794.)

A single specimen of this butterfly, hitherto, we believe, only obtained in Eastern India, was caught by us at Siddapur (above the ghâts, in the south of the district), in the month of January. We saw another at Karwar in June.

109. *Arhopala canaraica*, Moore. (No. 799.)

This butterfly is fairly common in the southern portion of the district, as far north as Kumta. It is also found sparsely in the valleys of Supa in the north. We have never noticed it in the neighbourhood of Karwar.

The larva is of the usual *Arhopala* type, but more flattened, and is of a pale, washed-out yellow, with a pink suffusion at the sides, and two pale yellow lines down the back; head small, with a brown crooked mark upon it; sides covered with numerous small hairs. It generally feeds on *Hopea*, but no doubt occasionally resorts to *kindal*—(*Terminalia paniculata*).

The pupa, which is formed in a cluster of leaves spun together, is of the usual *Arhopala* type, and is of a uniform dark brown.

110. *Arhopala bazalus*, Hewitson. (No. 804.)

This butterfly is found very much in the same localities as *A. canaraica*, Moore, but is rather more common though rare there. We have taken several in Karwar itself.

The larva is shaped similar to that of *A. canaraica*, but even more flattened. It is of a very transparent greenish-yellow, with a darker green dorsal band. The pupa is shaped like *A. canaraica*, and is unmarked, the abdominal portion being white, and the thoracic a transparent green. It feeds on *Hopea*, and rarely on *kindal*.

111. *Curetis thetis*, Drury. (No. 850.)

This is a common butterfly, especially on the coast throughout the rains. The beautiful green and white caterpillar has been so fully described in Mr. de Nicéville's book (vol. iii, page 287) that it is unnecessary to take up space in redescribing them. We have found them feeding upon the "karanj," (*Pongamia glabra*, Vert.), on *Wagatea spicata*, and also on the flowers of *Abrus precatorius*.

112. *Curetis bulis*, Doubleday and Hewitson. (No. 858.)

A form which we identify as this is much rarer than *C. thetis*, Drury, and the only dated specimen we have was taken at Gairsoppa in October. We also reared *Curetis* of this type above the ghâts on the flowers of *Ougeinia dalbergioides*, Benth. The larvæ were of a pinkish colour, but otherwise like *C. thetis*.

113. *Zesius chrysomallus*, Hübner. (No. 890.)

This is another very common coast butterfly in Canara. The larvæ feed on numerous plants (among them the guava, *Psidia guava*), but it is most commonly found on *Xylia dolabriformis* and *Terminalia tomentosa* and *T. paniculata*. It was described in our former paper. It is about the most carnivorous caterpillar we know, and woe to any *Arhopala*, or to one of its own kind, which attempts to change its skin

or turn into a pupa, if there is a nearly full grown *Zesius* about. He will be devoured in preference to any amount of tender leaves. Like the *Arhopalus*, *Zesius* is attended by red ants, and possibly one of their uses may be to restrain his cannibal habits. The larva and pupa are figured on Plate IV, figures 10 and 10a.

114. *Camena cippus*, Fabricius. (No. 893.)

We have only taken this butterfly in the neighbourhood of Karwar, where the males are common on sunny days on the tops of the hills. All the males of the genus *Camena* have the habit of basking on trees on the very highest peaks, and on a fine day specimens of the three kinds we find in Canara will almost certainly be taken. The first to appear is *C. deva*, Moore, which is generally basking by 10 o'clock; in another hour-and-a-half its place will be taken by this species, and late in the afternoon, about two o'clock, *C. cleobis*, Godart, appears. Of these *C. cippus* is the commonest, and *C. cleobis* the most scarce. Females of *C. cippus* are however rare, and we have only caught two specimens. They do not seem to have been described. They are larger than the males, and want the bright silver underside, being of a light copper colour; all the lines of the male are however accurately reproduced; on the hindwing on the underside the space between the linear band and the margin of the wing is a good deal suffused with white. Above, the female is similar to the male, but the brilliant dark metallic blue is replaced by a pale, but still slightly metallic, blue.

We have failed as yet to discover the caterpillar.

115. *Camena deva*, Moore. (No. 895.)

We have found this butterfly fairly abundant in Karwar during the rains, and also noticed it occasionally at other places and times throughout the district. These have, however, always been males, and all the females we have obtained have been by breeding. Out of some fifty reared, the majority have fortunately been females.

The larva, which feeds on the small velvety *Loranthus* (*L. tomentosus*), resembles in an extraordinary way the leaf of the food-plant, so much so that we have had to examine the plant again and again before the caterpillars had all been found when changing their food. It is of a woodlouse form, but with a distinct sharp ridge on the back, making a section almost triangular. When it is extended or bent, the segments are widely divided from one another. The texture is velvety, like

the leaf on which it is found ; in colour it is dull greenish, with a pinkish yellow tinge on the sides and the ridge of the back.

The pupa, which is fastened by the tail only along a leaf or stalk, is smooth, blunt at the head, with a hoof-shaped anal segment ; the thorax is humped and convex ; the abdomen is broad and high at segment 7, the fifth segment being suddenly higher than the fourth, making the dorsal constriction behind the thorax very pronounced ; after segment 9 the abdomen becomes quickly narrower. The colour is white with a broad lateral abdominal band meeting across segment 5 dorsally ; wings white with green-brown longitudinal streak ; belly white ; whole surface of pupa oily looking. The larva and pupa are figured in Plate V, figures 2 and 2a.

116. *Creon cleobis*, Godart. (No. 899.)


This is the rarest of our *Camenas*, but we have found it not uncommon at Karwar, and have a specimen from Siddapur taken in December.

The larva feeds on *Loranthus elasticus*, Desr., apparently only on the flowers. It is very similar in shape to *Tajuria longinus*, Fabricius : only it is more swollen on the 11th and 12th segments, producing constriction in the middle of the abdomen ; it is semi-circular in front, humped at segment 4, and slightly thickened laterally, being broadest at the 6th segment ; segments 7 to 10 are toothed dorsally ; the anal end is nearly square ; the surface is rough and shiny, the head well concealed and glossy. In colour the larva is greenish-yellow with a dorsal brownish band, segments 8 and 9 being, however, deep red-brown with a white dorsal patch, and segment 10 dark green with a subdorsal whitish line.

The pupa is like that of *C. deva*, Moore, but has a small conical point in front of each eye ; the anal column is long and consists of segments 10 to 14 : the colour is green, suffused with white on the thorax, the abdomen being yellow-green with a pinkish dorsal band.

The larva and pupa are figured on Plate V, figures 1 and 1a.

117. *Aphnæus vulcanus*, Fabricius. (No. 903.)

A common butterfly along the coast and in the thinner jungles above the ghâts. Its larva, which feeds on *Zizyphus jujuba*, is fully described in Mr. de Nicéville's book, and the specimens obtained by  entirely agree with his description.

118. *Aphnæus lohita*, Horsfield. (No. 910.)

This species is also abundant, especially in the early rains, in the neighbourhood of Karwar. Its caterpillar, which feeds on *Dioscorea* and *Xylia*, and also on "kindal" and on the guava, is shaped like that of *Arhopala*, but more rounded, very soft and velvety, and with longish hairs on the sides; the head is large and square, and the anal segment protected by a hard, flat, glossy plate, and there are two short processes on the 12th segment as in *A. vulcanus*, Fabricius. In colour the head and anal cover are glossy brown, the rest of the body being dark green with a broken white band upon each side, or dark brown mottled with lighter shades.

The pupa is of the *Arhopala* type, but much narrowed: the back is ridged, but not sharply so, and the head blunt. In colour it is dark glossy brown. It is fastened by the extremity only, along a leaf.

The larva and pupa are figured on Plate V, figures 3 and 3a.

119. *Aphnæus concanus*, Moore. (No. 911.)

We have specimens of this butterfly, named by Mr. de Nicéville, all taken towards the end of the rains or during the cold weather. We consider it is probably the cold weather form of *A. lohita*, Horsfield, though it looks very different.

120. *Tajuria indra*, Moore. (No. 926.)

A distinctly scarce species, though noticed at Karwar occasionally throughout the rains and at various places above and along the ridge of the ghâts in the hot and cold weather.

The larva, which feeds on *Loranthus elasticus*, preferring the flowers, is in form like that of *T. longinus*, Fabricius, but all the segments are well defined and slightly elevated in the middle. The third and fourth segments are slightly larger than the others, but not nearly to the same extent as in *T. longinus*. Colour a uniform dark brown, often suffused with grey, with the exception of the third and fourth segments, which are sometimes light brown on the back.

The pupa, which is fastened by the anal extremity along a leaf, is like that of *T. longinus*, but smooth on the thorax, with four abdominal ridges; head square; colour chiefly brown, but the wing-covers are greenish, and the abdomen has a greenish ground marked with pinkish-brown, while the thorax has some white markings. When looked at from above, it has the appearance of a human head, like the pupæ of the genus *Spalgis*.

The larva and pupa are figured in Plate V, figures 4 and 4a.

121. *Tajuria longinus*, Fabricius. (No. 931.)

Common along the coast, and, like *T. indra*, Moore, the females are almost as often seen as the males, while in the nearly allied genus *Camena*, although breeding has shown certainly that as many females are produced as males, a female is hardly ever obtained by the net. The larva, which feeds on both the common species of *Loranthus* (*L. elasticus* and *L. wallichianus*), has the head flattened, and the next segments enlarged: the segments then decrease in size to the anal segment which is broad and rectangular at its extremity. Looked at from above, the caterpillar is broad at the anal segment, narrow at the next four segments, and very broad at the thoracic segments. In colour it is green, but has triangular marks of mottled white on each side, and a rounded similar mark above on each segment.

The pupa resembles that of *T. indra*, but the abdominal segments are much more angular than in that species.

122. *Ops melastigma*, de Nicéville. (No. 935.)

This species we have never seen at large; but in September, on the Godhalli Hill close to Karwar, we obtained five small larvæ feeding on the velvety *Loranthus* (*L. tomentosus*), which we hoped would turn out to be *Camena cippus*, Fabricius, as they closely resembled the larvæ of *C. deva*, Moore. Three of these died, but the others, to our surprise, turned into this species. They were very similar to those of *C. deva*, but the end of the anal segment was prolonged into two short points. The colour also was redder, and they had two lateral red lines. Just before they became pupæ, the central segments contracted, and a triangular green mark, meeting on the back, appeared on each side.

The pupa was suspended along a leaf or stem, and was very similar in shape to that of *Camena cleobis*, Godart; it had, however, two extra points on the second segment, a tubercle on the shoulder, and a conical lateral tubercle on segments 6, 7, and 8, as also a roughened dorsal rising on the same segments. In colour it was a dark apple-green, whitened on the wing-cases; the last five segments yellow-brown marked dorsally with black and white; head points pure white; a white mark along the sides of the thorax suffused with brown.

We have, since writing the above, taken upwards of twenty larvæ, but have never seen the butterfly at large.

123. *Chliaria othona*, Hewitson. (No. 947.)

A butterfly we originally considered very rare, as for several years the only specimens we possessed were one male caught in Karwar in the rains, and two caught in one sweep of the net at Siddapur in December. Now, when we know its habits, we find it is not uncommon in many places above and below the ghâts. It is often difficult to distinguish from *Lampides*, or *Nacaduba*, while resting, as it will not allow a close examination; and to obtain specimens one must catch all suspicious blues. Its larvæ may be got, however, with little difficulty by carefully examining all clusters of orchid flowers in May and June; the empty eggs will generally be discovered in the first place on the outside of the flowers, and then the larvæ must be hunted for inside the flowers. They are of the usual onisiform shape, but with all the segments well defined, and with the anal segment extended into two distinct short protuberances; head concealed, whole surface clothed with minute bristles; colour green, with a rosy-red dorsal band and three wavy lines of the same colour on each side; the anal protuberances are also of the same colour.

The pupa, which is fastened along the stem of the orchid, is smooth, of the common lycaenid type, greenish-grey, slightly marked with white, and with generally a distinct wavy mark on the wing-covers.

They are figured in Plate V, figures 5 and 5a.

124. *Zeltus etolus*, Fabricius. (No. 951.)

A by-no-means common and very local butterfly. We have taken it about Karwar in the rains, in particular places, and in one or two small pieces of jungle both above and below the ghâts; but fifty yards on each side of its haunts not a specimen will be found.

125. *Cheritra jaffra*, Butler. (No. 958.)

A very abundant species both above and below the ghâts, and very easily noticed owing to its long white tails.

The larvæ feed on "Jamba" (*Xylia dolabriformis*), and are of the woodlouse form with a raised ridge along the back, furnished with six sharp, oblique, pointed protuberances; the anal segment is flattened, and the sides slope down to it, forming nearly rectangular corners; colour either green or pink, the protuberances being generally tipped with brown, which occasionally extends and forms a saddle, as shown in the illustration.

Pupa fastened along the stalk by the tail only, smooth, except in the centre of the abdomen above, where there are rough, sharpish protuberances ; its colour is green, becoming browner as it nears the imago state, marked on the wing-covers and on the back of the abdomen with pink.

They are figured in Plate V, figures 6 and 6a.

126. *Rathinda amor*, Fabricius. (No. 959.)

A very common butterfly everywhere.

The larva, which feeds generally on the flowers, or young shoots, of "*Pitkuli*" (*Eugenia zeylanica*), but also on *Hopea* and other things (we reared one on a common garden croton), is of a pale green, with a line of long, pink protuberances along the back, the last curved outwards and upwards, two protuberances curved outward on the sides of the last segment, and on the fourth segment a straight, sharp-pointed one low down laterally ; the line of dorsal protuberances branches near the head into two.

Pupa similar, but much smaller than that of *Cheritra jaffra*, Butler, and perfectly smooth ; it is also fastened along a stalk, but generally at a greater angle from the stalk than in that species.

The larva and pupa are figured on Plate V, figures 7 and 7a. The pupa should not hang down as figured.

127. *Horaga onyx*, Moore. (No. 960.)

A local, but not excessively rare, species. We have once taken it in Karwar, and it is fairly common among the evergreen jungles in the south of the district.

128. *Catapœcilma elegans*, Druce. (No. 967.)

A fairly common species in Canara, noticed throughout the district and at all times.

The larva, which feeds on "*kindal*" (*Terminalia paniculata*), is onisciform, flattened, head and tail segments looking very similar ; head completely concealed ; it is roughish in texture, but not pubose ; colour dirty green, with a patch of dark green in the centre of the back ; it is also a good deal mottled everywhere. Pupa fastened by the tail along a leaf, narrow, without projections of any kind ; of a greenish-brown, minutely dotted with darker brown.

They are figured on Plate V, figures 8 and 8a.

129. *Loxura atymnus*, Cramer (No. 977)=*Loxura surya*,
Moore. (No. 978.)

We consider these species to be the same. The rains form exactly agrees with the description of *L. surya*, Moore, the type specimen of which came from this district; while in the hot weather, the form found is typical *L. atymnus*, or, as far as we can make out, does not differ from specimens of such sent us from other parts of India. It is common in Karwar, and in all the jungles along the coast, throughout the early part and middle of the rains. Above the gháts, where we have generally been during the greater part of the cold and hot seasons, the butterfly is rare.

The larva, which feeds on young shoots of *Dioscorea*, is of the wood-louse shape, the back being raised and rounded; the head is concealed, and there is a small flat plate over the segment next the head, and another on the anal segment. The colour is dull green, suffused with pink (the colour of the young leaves on which it feeds) on both sides.

The pupa, which is fastened along a leaf by tail and band, is blunt, lengthened, and devoid of excrescences; it is of a pale green colour, with the edge of the wing-cases clearly marked with pinkish-purple.

130. *Deudoria epijarbas*, Moore. (No. 986.)

This butterfly, which is in habits, both imago and in the earlier stages, very closely allied to *Virachola*, and whose underside is almost similar, is rather rare throughout the district. We have, however, taken it in the neighbourhood of Karwar, and in a good many places below the gháts. It lays its eggs on the outside of the pods of *Cinnarus ritchiei*, and the larva, on coming out of the egg, enters the pod at the edge of the stalk, thereby leaving no trace. It feeds on the soft inside, only coming out when that is finished to enter another pod.

It is of the usual lyeænid shape, but from above looks more like a large maggot: the head is very small, the segments well defined, gradually increasing in width to the fourth, and with the sides edged with minute hairs. It has a large plate covering the anal segment and that adjoining it. Its colour is a dull green, marked with indistinct brown, with the exception of the second and third segments, which are yellow, the second segment having two small black spots on the back.

The pupa, which is formed inside the fruit, is rather narrow, and without any protuberances; it is of a rough texture and of a reddish-brown colour, mottled with darker brown.

The larva and pupa are figured on Plate V, figures 9 and 9a.

131. *Zinaspā todara*, Moore. (No. 988.)

This is a rare insect in Canara. We have found it occasionally in the south of the district, above the ghāts, in the hot and cold weather, and also in the Supa Petta in the north, where its larvæ were found in some abundance. They clearly show, what was surmised by Mr. de Nicéville, that this genus is hardly separable from *Surenbra*. The larva, which feeds on *Acacia cæsia*, a very nearly allied food to that of *S. quercetorum*, Moore, is almost similar, differing only in the third segment overhanging the second; the colour is exactly the same, and the pupa is indistinguishable.

132. *Rapala schistacea*, Moore. (No. 995.)

This species is very common in the south of the district, and fairly so near the close of the rains at Karwar, and also generally everywhere in Canara. It is the only really common species of the genus here.

We have reared the larva on the flowers of the common garden creeper *Quisqualis*, and also on those of *Acacia cæsia*.

It is shaped like the larva of *Zinaspā*, but has a subdorsal fleshy tooth on each side of segments 3 to 10, as also a marginal tooth to each of these segments; on the second segment there are two protuberances pointing forward; the 11th and 12th segments have each a lateral broad tooth, and the last is produced into a double tooth; the colour is of an almost uniform dark rose.

The pupa is of the usual form, stout, and pink in colour, with black blotchings.

133. *Rapala lankana*, Moore. (No. 996.)

This is a very local species. We have taken odd specimens in the south of the district, and seen others elsewhere, during the travelling season, and we have taken many specimens at Karwar in the first three months of the rains. There it is so local that nearly all our specimens have been taken in a group of half a dozen bushes, not occupying ten square yards, on the side of a road, and most were sitting on the flowers of a single bush of *Leea sambucina*. Now this plant is one of the commonest in the neighbourhood, and there were hundreds within the nearest quarter of a mile; and yet, though on one morning we found and captured three perfect specimens sitting together on one flower of this bush in one sweep of the net, and two more on an adjoining flower with the next sweep, a couple of hours' careful

search did not disclose another specimen anywhere. When we wanted any of this species, the only way was to go to the one bush, catch any on it, and come home, for all that were on the wing would be there.

134. *Rapala varuna*, Horsfield = *orseis*, Hewitson. (No. 998.)

This butterfly, which much resembles *R. schistacea*, Moore, is easily mistaken for it. It may be discriminated in either sex by the much broader markings on the underside. We have found it both at Karwar and above the ghâts, but not so plentifully anywhere.

The larva in shape and protuberances is exactly similar to that of *R. schistacea*, but the colour is green with a curved diagonal line, almost pure white, to each segment; the fifth segment is very dark green, in some cases almost black, forming a band. The larva feeds on the flowers of *Zizyphus xylopyrus*. The pupa is identical with that of *R. schistacea*.

135. *Rapala melampus*, Cramer. (No. 1006.)

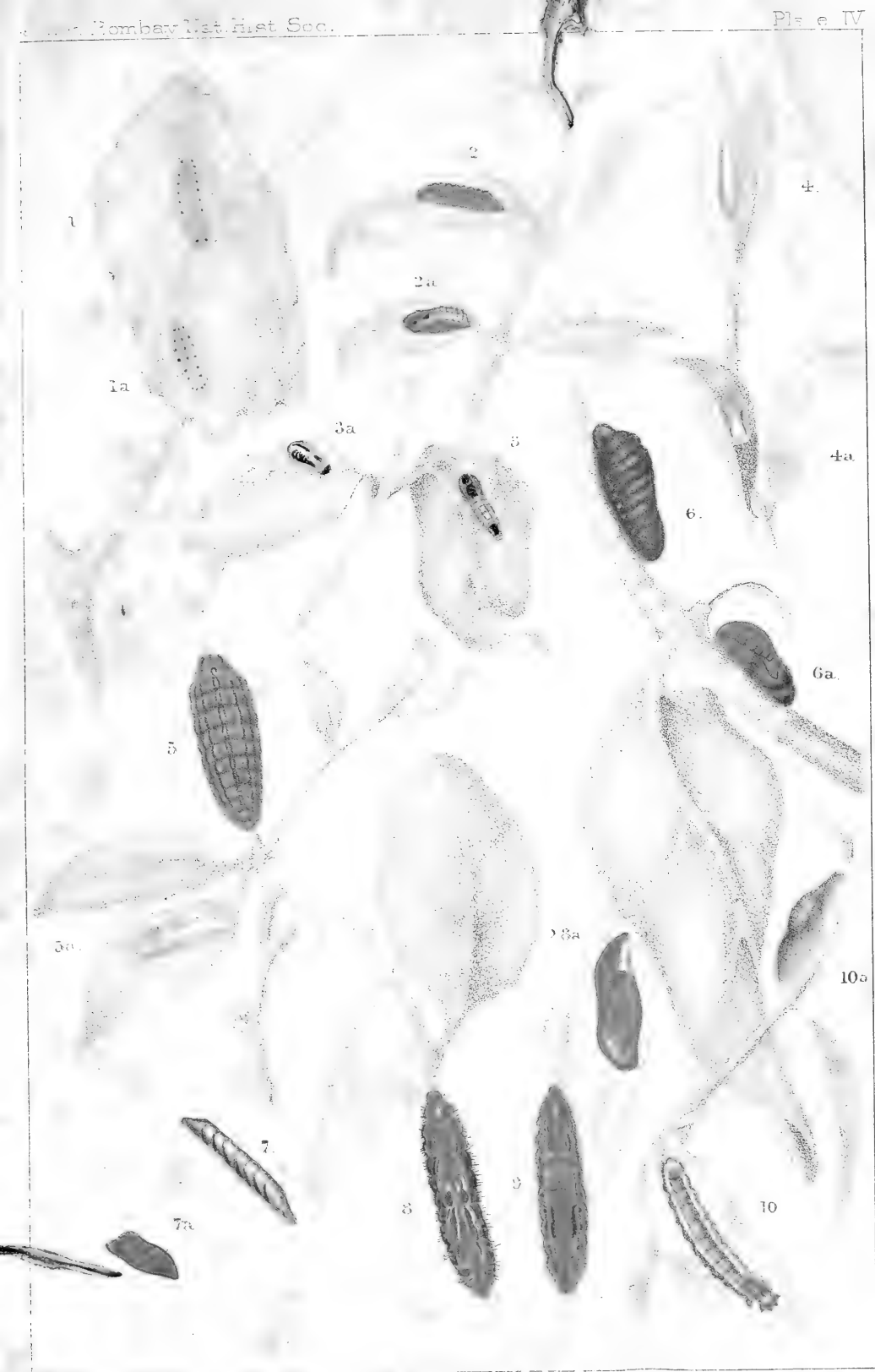
This butterfly is rare in the heavy rainfall tracts which form the greater part of Canara. It is found, however, on the Dharwar border in the east of the district in moderate numbers.

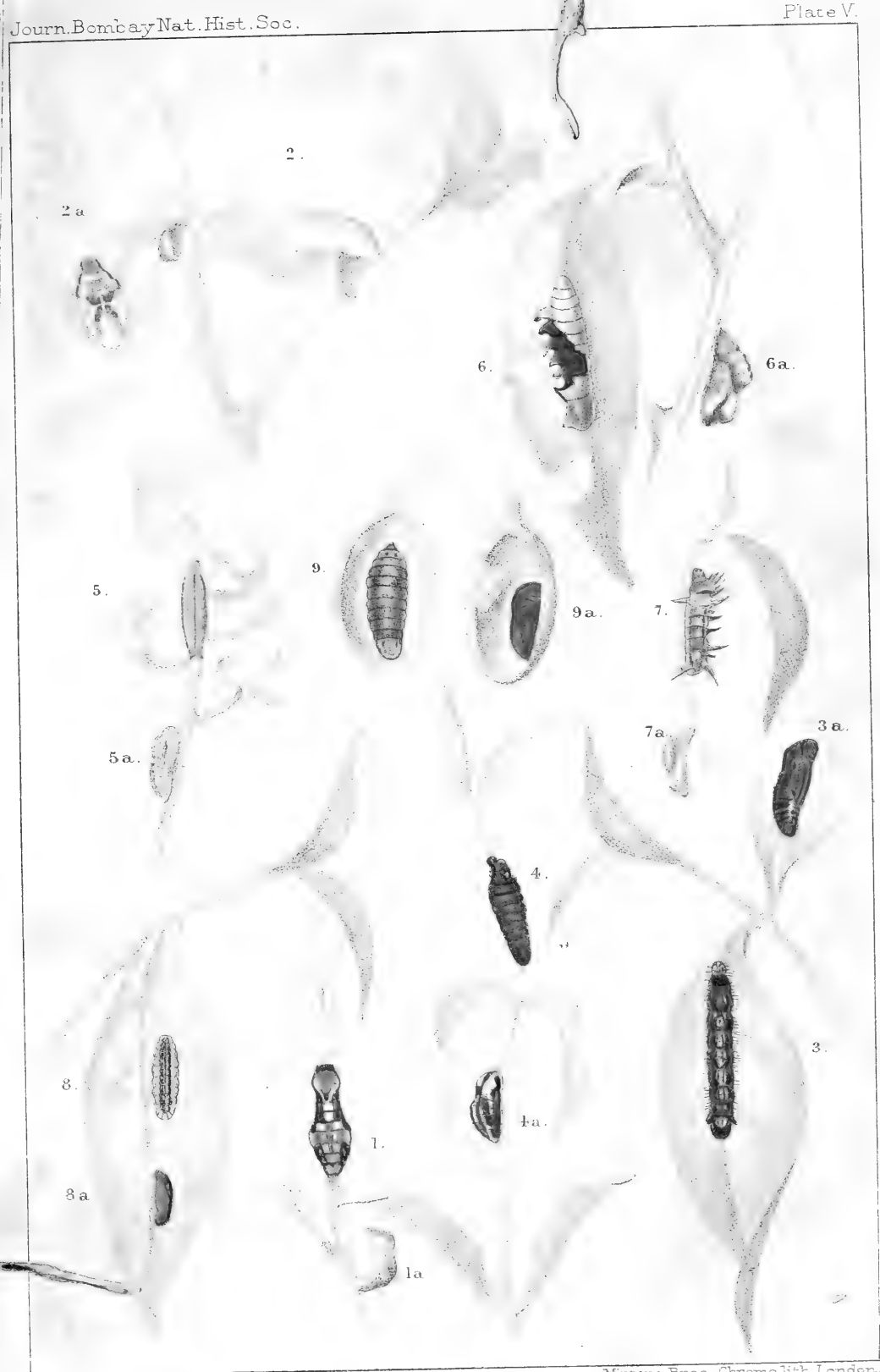
The larva feeds there on the flowers of *Ougeinea dalbergeoides* and *Zizyphus rugosus*. It is exactly similar to that of *R. schistacea*, Moore, but the colour is pure white, changing to rose before turning into a pupa. The pupa is similar to that of *R. schistacea*.

136. *Bindahara sugriva*, Horsfield. (No. 1011.)

This butterfly we have taken occasionally at Karwar and in most of the talukas along the edge of the ghâts; the only place, however, where it used to be common, as far as we have observed, was over a bridge on the road to the Mysore side of the Gairsoppa waterfall. The jungle there was thick, and formed a bank, and about Christmas one could catch 8 or 10 in a morning on the flowers of *Leea*, which it much frequents. Unfortunately, the Mysore Government in building a bungalow have completely cleared the jungle in this place, and the last time we were there we did not see a single specimen. We have reared the larva of this at Karwar feeding in the inside of the fruit of a creeper.

The larva much resembles that of *Virachola isocrates*, Fabricius, but may be distinguished by the whole of segments 7 and 8 being creamy-white, with a small dorsal and lateral patch of dark purplish-brown;







whereas *V. isocrates* has only the dorsal part of these segments marked with white patches. The pupa is indistinguishable.

137. *Virachola isocrates*, Fabricius. (No. 1012.)

A rare butterfly at Karwar, and generally below the ghâts, but fairly abundant in the eastern portion of the district above them. The larvæ and their habits have been repeatedly described. We have in this district discovered them in tamarind pods and also on the fruit of *Randia uliginosa*.

138. *Virachola perse*, Hewitson. (No. 1013.)

This species is very common everywhere in Canara, and the larvæ and pupæ may be found from July to April in the fruit of the *Ghela* (*Randia dumetorum*). They have been described by de Nicéville.

EXPLANATION OF THE PLATES.

PLATE IV.

- Figs. 1, 1a... Larva and pupa of *Talicada nyseus*, Guérin, p. 375.
 „ 2, 2a... „ „ „ *Nacaduba atrata*, Horsfield, p. 376.
 „ 3, 3a... „ „ „ *Castalius ananda*, de Nicéville, p. 379.
 „ 4, 4a... „ „ „ *Castalius ethion*, Doubleday and Hewitson, p. 380.
 „ 5, 5a... „ „ „ *Amblypodia anita*, Hewitson, p. 380.
 „ 6, 6a... „ „ „ *Iraota timoleon*, Stoll, p. 381.
 „ 7, 7a... „ „ „ *Surendra quercetorum*, Moore, p. 381.
 „ 8, 8a... „ „ „ *Arhopala centaurus*, Fabricius, p. 382.
 Fig. 9, ... Larva of *Arhopala amantes*, Hewitson, p. 382.
 Figs. 10, 10a... Larva and pupa of *Zesius chrysomallus*, Hübner, p. 383.

PLATE V.

- Figs. 1, 1a... Larva and pupa of *Creon cleobis*, Godart, p. 385.
 „ 2, 2a... „ „ „ *Camena deva*, Moore, p. 384.
 „ 3, 3a... „ „ „ *Aphnæus lohita*, Horsfield, p. 386.
 „ 4, 4a... „ „ „ *Tajuria indra*, Moore, p. 386.
 „ 5, 5a... „ „ „ *Chliaria othona*, Hewitson, p. 388.
 „ 6, 6a... „ „ „ *Cheritra jaffra*, Butler, p. 388.
 „ 7, 7a... „ „ „ *Rathinda amor*, Fabricius, p. 389.
 „ 8, 8a... „ „ „ *Catapœcilmia elegans*, Druce, p. 389.
 „ 9, 9a... „ „ „ *Deudorix epijarbas*, Moore, p. 390.

(To be continued.)

A CATALOGUE OF THE FLORA OF MATHERAN AND
MAHABLESHWAR.

By H. M. BIRDWOOD.

"There is a pleasure in the pathless woods."

"Flowers of all heavens, and lovelier than their names,
Grew side by side."

In now offering to the Society a third edition of the Catalogue of the Flora of Matheran, published in Vol. I of our Journal, and a second edition of the combined Matheran and Mahableshwar Catalogues which appeared in Vol. II, I ought perhaps to explain that I do so, not because those catalogues, as separately published by the Society in pamphlet form, are out of print,—for, so far as I know, there has been no great demand for them,—but because their publication has proved of use in one of the ways I particularly desired, and various members of the Society have been induced to make a special study of our Hill Flora and have made many additions to my lists; and it seems desirable that the result of their researches during the last nine years should now be recorded in the Journal. The Catalogue is indeed still far from complete, for the obvious reason that, during the four rainy months of the year, when most of the herbaceous plants are at their best, the hills are practically inaccessible to most of us, and even in the dry months our visits to Matheran and Mahableshwar are far too short and too much preoccupied with other business to be turned to much scientific account. Yet, with the aid of such competent botanists as the Revd. Dr. Fairbank, the late Mr. Gustav Carstensen, the Revd. A. K. Nairne, Dr. Theodore Cooke, Surgeon-Major Kirtikar, Mr. Marshall Woodrow, Dr. Lisboa, the late Mr. Chester Macnaghten, Dr. MacDonald, Mr. James MacDonald and Mr. Dhargalker, I have now been able to add 183 names to the list published in 1887, which included 493 plants, whereas the present list contains 676 names. And a great pleasure it has been to identify the new plants as they were collected from time to time. Only a few months ago, I had several new discoveries communicated to me by Mr. John Macpherson, and among them the beautiful Larkspur, *Delphinium dasycaulon*, a plant between two and three feet high, with flowers of bright, metallic blue, which I have seen in abundant bloom at Purandhar but had searched for in vain at Matheran, where it has now at last been found near Panorama Point; and even while

these pages have been passing through the press, I have been indebted to Mr. W. P. Symonds for some important additions to the Catalogue. Nor can I forget the day when my faithful friend Vittu led me, with much solemnity, to a tree in the jungle below Chowk plateau, not many hundred yards from my own house,—a tree well known to him and others, afflicted like him, in the monsoon months, with dire, internal pains, which could only be cured by decoctions of its bark. This was the *Máhárik* or “the great tree,” the wild Cinnamon (*Cinnamomum Tamala*). It is striking and handsome, though of no great size, with tufts, when first bursting into leaf, of small, pale, pink, transparent leaves, which afterwards lengthen and become pointed at both ends and have marked ribs or nerves, and are dark and shining above, and when dried turn to a rich brown, and yield a sweet spicy scent when crushed. I had never noticed it before, though I must have passed near it a hundred times. Nor had Dr. Wellington Gray ever noticed it, though he was a most enthusiastic searcher after plants, to whom we in Bombay are indebted for some of the loveliest of our garden plants, introduced by him during a long series of years. I have found only four specimens of the cinnamon tree at Matheran and none at Mahableshwar. It seeds freely, however, and can be readily grown from seed; and I hope it will some day be as familiar in the public and private gardens of Bombay as many other trees of the Konkan and the Dekhan and other parts of India have lately become. Another notable tree (not before included in my lists), of which as yet I have seen only one specimen at Matheran, is the *Canarium strictum*, which yields a balsam which is burnt as incense³ by some of the hill people at their religious services and is in much request for this purpose, and is allied to other balsamiferous trees which grow in profusion on the Gháts traversed on the several routes to Mahableshwar. I have often wondered how it came to plant itself in the thick wood near the chowki, far from its congeners and hemmed in by countless aliens. Its position there is almost as remarkable as the isolated imprint of Friday’s foot on the sea shore, which so disconcerted that Prince of Naturalists, Robinson Crusoe.

It may be as well if I repeat here the reasons I gave in Vol. II for making a combined catalogue of the flora of Matheran and Mahableshwar. The vegetation of the two hills is not indeed identical. Dr. Cooke

estimated that, excluding grasses, about 140 flowering plants are found at Matheran which have not been seen at Mahableshwar, and 130 at Mahableshwar which have not been seen at Matheran. There are, no doubt, certain causes regulating the distribution of plants which are not equally operative at both places. Mahableshwar is about 70 miles nearer the Equator than Matheran. The latter rises from the plain of the Konkan, midway between the Western Gháts and the sea; whereas Mahableshwar is further from the sea, and is, to all intents, a part of the range of Gháts. The highest point of Matheran is about 2,500 feet above the sea-level; whereas the Mahableshwar plateau is at a general elevation of 4,500 feet above the sea, and at Sindola rises to 4,700 feet. These differing conditions are not without their effect. Some plants are found at Mahableshwar which will not thrive on the lower mountain-top. Some Matheran plants, on the other hand, find the higher levels of Mahableshwar beyond their range. I will give here only a few instances. The most casual observer is struck by the wonderful undergrowth of brake-fern at Mahableshwar, and of the arrowroot plant,—which in the months of October and November blooms on almost every square yard of the jungle,—and by the beautiful profusion of the *Osmunda* fern, mixed with brambles, clustering roses and willows, along the upper stream of the Yenna River. At Matheran, the brake-fern is scarcely known. In a few years it will be extinct, if it is not already so; for it cannot defy the onslaughts of thoughtless fern-hunters. It would be impossible for any number of fern-hunters to destroy it at Mahableshwar. Even if unmolested at Matheran, it drags on at best but a feeble existence. The site is too low for it, the lowest limit of its range in our latitude being probably at a line at least 2,000 feet above the sea level. The *Osmunda* again is not known at Matheran; nor is the willow (*Salix tetrasperma*); nor the arrowroot (*Hitchenia caulina*); though other allied plants of the order *Scitamineæ* are plentiful enough. On the other hand, there are some well-known Matheran trees, such as the Kumbha (*Careya arborea*), the Malia or Indian Ebony (*Diospyros assimilis*), and the Chandara (*Macaranga Roxburghii*), which do not grow on the Mahableshwar plateau at all. Dr. T. Cooke made the flora of Mahableshwar and Matheran a special study for many years, and prepared a “Note” on the more prominent

plants on either hill which are not found on the other, which was published with the last edition of this Catalogue, and is so full of interest that I have asked Mr. Phipps to re-publish it as a supplement to this edition, and I have added to it a few notes based on the observations of the late Mr. Chester Macnaghten. But after full account is taken of all divergences, it will still be found that very many of the plants included in the Catalogue are common to the two hills. Such a coincidence is favoured by the practical identity of their geological formation, and by the circumstance that there is no great difference in the range of their mean temperature at different seasons and in their rainfall. Both Mahableshwar and Matheran are, roughly speaking, huge masses of trap, capped by a thin layer of laterite. Both are within sight of the sea. Both are swept by the same dry winds in the cold weather and by the same monsoon storms, and both enjoy the full benefit of the monsoon rains. Mr. N. A. Moos, Director of the Government Observatory at Colaba, has favoured me with information as to the temperature and rainfall on both hills deduced from the figures recorded at the Observatory during a period of ten years; and it appears that the average mean temperature ranges at Mahableshwar from $63\cdot3^{\circ}$ F. to $71\cdot70^{\circ}$; and from $67\cdot8^{\circ}$ to $78\cdot5^{\circ}$ at Matheran. The average rainfall at Mahableshwar amounts to 281·4 inches; and at Matheran to 224·7 inches. Under such concordant influences, it is not surprising that a marked similarity should be noticeable in the general outward forms of vegetation on the two hills, due to the frequent presence of the same characteristic plants on both. Everywhere at Mahableshwar, as at Matheran, we find the Myrtle tribe represented by endless woods of the beautiful Jambul tree (*Eugenia jambolana*), the Melastomas by the Anjan (*Memecylon edule*), the Laurels by the Pisa (*Actinodaphne Hookeri*), and the Madder tribe by the thorny Gela (*Randia dumetorum*). There is the same undergrowth of shrubs and herbaceous plants, the natural orders of "Leguminosæ," "Acanthaceæ" and "Compositæ" being specially and numerously represented. There are many showy climbers and trailers and creepers common to both hills; as there are Orchids and Dendrobiums and other parasitic plants; while everywhere the little silver-fern covers with equal impartiality every sheltered bank and rock. The flora of both Mahableshwar and

Matheran can, therefore, be conveniently included in a single Catalogue; and I have also included in my list a few plants which are not actually found on either hill, but which are conspicuous enough to catch the eye of even the most rapid traveller on the higher levels of the well-worn roads from Poona and Wathar to Panchgani and Mahableshwar, and also some plants noticed on the FitzGerald Ghát between Mahableshwar and Pertabgarh.

It only remains for me to add that this Catalogue is framed with the same object and on the same general plan as the former one. It is meant, with the aid of the appended index of vernacular names, to furnish a ready method of learning the scientific names of plants. Many visitors to the hills take an interest in learning those names even if they have no intention of undertaking the serious study of Botany in any of its various branches. With some, however, the interest thus acquired leads to further study, which becomes all the pleasanter for the knowledge which has been gained, without too much trouble, of the names by which the plants in which they are interested are known to the scientific world;—just as it is pleasanter and more profitable to study the grammar of a new language after the student has acquired some portion of its vocabulary, and learnt to speak it a little, than before.

In the first two columns of the Catalogue, the nomenclature adopted is that of Hooker's "Flora of British India," Vols. I to VI. The words "Herb. Co.," after the name of a plant in the second column, indicate that the Mahableshwar herbarium, presented to the Society by Dr. Theodore Cooke, contains a specimen of the plant. In the third column, the vernacular names are spelt according to the Hunterian system. The word 'vel' or 'yel,' which recurs frequently as a component part of a name, means a 'creeper' or 'climber.' The words 'lahan' and 'dhakta' (fem. 'dhakti') mean 'small,' 'motha' (fem. 'mothi') means 'big,' 'pandhra' means 'white,' 'kala' 'black,' 'tambda' 'red,' 'pivla' 'yellow,' and 'kadu' 'bitter.' The prefix 'ran' indicates a 'jungle' plant, or, as we should say, a 'wild' plant; though nearly all the plants in the list may be regarded as wild or indigenous on Mahableshwar or Matheran, the more notable exceptions being the hedgerow Rose, the Oak, the Casuarina, the Lantana, the Strawberry, the Eucalyptus, the Spanish "Lady of the Night."

(*Brugmansia candida*), the Mulberry, the Peach, the Coffee, the Cinchona, the Jack-tree (*Artocarpus integrifolia*), and the large yellow flowered flax (*Reinwardtia trigyna*), which, however, is said by Major H. H. Lee, R. E., to be "found truly wild on Varandha Ghât" in the Satara District.—("Gazetteer of the Bombay Presidency," Vol. XIX, App. A). The home of the species of mulberry commonly grown in the Mahableshwar gardens "is probably China."—(Brandis.) According to Wight and Beddome, the Jack-tree is "wild in the mountain forests of the Western Ghâts, ascending to 4,000 feet." But Dr. Brandis remarks that "regarding its native home there is yet some uncertainty." The others have evidently been introduced within the last 50 years, but some of these have already established themselves more or less firmly.

In conclusion, I would desire to express my sincerest acknowledgments to the friends who have kindly helped me, either by communicating the names of new plants or in preparing this revised edition of the Catalogue for the press. My thanks and, I think I may add, the thanks of the Society are especially due to the Revd. Mr. Nairne, who has contributed many new names; to the Revd. Dr. Fairbank, who sent me the names of many ferns which were quite unknown to me; to Dr. Lisboa, for a complete list of the grasses found by him on both hills; to Surgeon-Major Kirtikar for a list of fungi and mosses, which he has prepared with much labour and with rare knowledge of this branch of the vegetable kingdom; and to Mr. James MacDonald, for revising the whole Catalogue with the utmost care and correcting the earlier proofs for the press.

As on former occasions, I trust that the Secretary will be able to issue separate interleaved copies of the Catalogue, with Dr. Cooke's note, for the use of those members of the Society who may desire to become better acquainted with the hill flora of this Presidency and be disposed to make any necessary corrections in the present list of names or to add new names.

A CATALOGUE OF THE FLORA OF MATHERAN AND MAHABLESHWAR.

DIVISION A.—PHANEROGAMIA or FLOWERING PLANTS.

CLASS I.—DICOTYLEDONES or EXOGENS.*

Section (1)—Angiospermæ.

SUB-CLASS 1—THALAMIFLORE.†

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
1. Ranunculaceæ (The Buttercup Order).	<i>Clematis triloba</i> , Heyne...	Mahableshwar (Symonds).
"	" <i>Gouriana</i> , Roxb.	Mor-yel, Ránjai. Travel- ler's joy.
"	" <i>Wightiana</i> , Wall.	ib, Mahableshwar. Flowers yellow.
"	<i>Delphinium dasycaulon</i> , Fresen.	Near Panorama Point, Matheran (Macpherson).
2. Dilleniaceæ.....	<i>Dillenia pentagyna</i> , Roxb.	Karambel, Dhákta Karmal.
3. Anonaceæ (The Custard-apple Order).	<i>Uvaria Narum</i> , Wall.....	Naram-panal.
"	" <i>lurida</i> , H. f. & T.	
"	<i>Bocagea Dalzellii</i> , H. f. & T.	Rahat-kinjal.
4. Menispermaceæ.....	<i>Cocculus macrocarpus</i> , W. & A., Herb. Co.	Vátoli, Vát-yel, Wátan-yel.
"	" <i>villosus</i> , DC.	Tán, Vásan-yel. Sans. Vá- sadani.
"	<i>Cyclea peltata</i> , H. f. & T., Herb. Co.	Pár-yel.

* In the seeds of Dicotyledones there are always two cotyledons at least, and if there are two only, they are always opposite. In the section "Angiospermæ" the ovules are enclosed in an ovary.

† The differences of the four sub-classes into which De Candolle divides the class of Exogens or Dicotyledones "might be, in most cases, expressed thus:—

"1 Polypetalous—

Stamens hypogynous.....=Thalamifloræ.

Stamens perigynous=Calycifloræ.

"2. Monopetalous.....=Corollifloræ.

"3. Apetalous=Monochlamydeæ.

"It is, however, to be observed that some of the Calycifloræ and Thalamifloræ have a monopetalous corolla. In this classification, the student proceeds from what are considered the most perfectly organized Exogens to those which are least so. Thus, all the parts are present and distinct from each other in Thalamifloræ; other things remaining the same, the stamens adhere to the calyx in Calycifloræ; the stamens join the petals and the petals each other in Corollifloræ; and in Monochlamydeæ, first the corolla disappears, and then, among the most incomplete orders, the calyx also ceases to be developed." (Lindley's "School Botany.") Orders 42, 47, 48 in this Catalogue are placed under "Calycifloræ," in accordance with De Candolle's arrangement. According to the plan adopted by Lindley, who regards the essential mark of Corollifloræ to reside in the monopetalous corolla, these orders would come under "Corollifloræ."

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
5. Papaveraceæ (The Poppy Order.)	<i>Argemone mexicana</i> ,* <i>Linn. Herb. Co.</i>	Pivl; Dhotra. Mexican Poppy.
6. Cruciferae (The Cabbage Order.)	<i>Nasturtium officinale</i> , Br., <i>Herb. Co.</i>	Water-cress.
"	<i>Cardamine subumbellata</i> , <i>Hook. Herb. Co.</i>	
7. Capparideæ (The Caper Order.)	<i>Capparis spinosa</i> , <i>Linn., Herb. Co.</i>	Indian Caper. "The young flower buds are the capers of commerce" (Lee).
"	" " <i>var. vulgaris</i> .	Bed of nulla, near Cemetery, Mahableshwar (Fairbank).
"	" <i>pedunculosa</i> , Wall.	Kolisna, Kolisra.
"	" <i>longispina</i> , H. f. & T., <i>Herb. Co.</i>	<i>ib.</i>
"	" <i>horrida</i> , <i>Linn. f.</i> ...	Near Alexandra Point, Matheran.
8. Bixineæ (The Annotto Order.)	<i>Flacourtia Ramontchi</i> , † <i>L' Herit. Herb. Co.</i>	Támbat. <i>Sans.</i> Svádu Kantak.
"	" <i>montana</i> , <i>Grah.</i>	Atak. Near the Chauki, Matheran.
9. Pittosporæ	<i>Pittosporum floribundum</i> , <i>W. & A., Herb. Co.</i>	Yekadi.
10. Polygalæ (The Milk Wort Order.)	<i>Polygala persicariæfolia</i> , <i>DC.</i>	Mahableshwar Milk-wort.
11. Caryophyllæ (The Clovewort Order.)	<i>Polycarpon Lœflingæ</i> , <i>Benth. & Hook. f.</i>	Mahableshwar. Common in potato gardens above the lake. Flowers in April (Cooke).
12. Portulacæ	<i>Portulaca oleracea</i> , <i>Linn., Herb. Co.</i>	Ghol-báji.
13. Tamariscineæ	<i>Tamarix ericoides</i> , <i>Roitl.</i> ...	Jao, Sarub, Saráta. Tamarisk. In the river bed near Neral station. Smoked for asthma.
14. Guttiferae (The Gamboje Order.)	<i>Garcinia indica</i> , <i>DC.</i> ..	Kokam, Rátambá. Wild Mangosteen. At Matheran the fruit is seldom bigger than a walnut; though elsewhere it has been found "as large as an orange" (Hooker, vol. I, p. 261).
"	" <i>ovalifolius</i> , <i>Hook. f.</i>	Jangli Rámphal. Matheran Gamboje tree.
"	<i>Ochrocarpus longifolius</i> , <i>Benth.</i>	Harkia, Surangi, Satwin.

* The *Argemone* is a small American genus, of which this species is "naturalized throughout India" (Hooker).

† The wood of *Flacourtia Ramontchi* "does not warp, is durable, and not attacked by insects. Combs are made of it; it is employed in turnery and for agricultural implements, and though not large, it is occasionally used for building" (Brandis).

Natural Order	Genus and Species.	Vernacular or English name, use, habitat, &c.
15. Dipterocarpeæ	<i>Ancistrocladus Heyneanus, Wall.</i>	Kardor, Kardori, Karn-dori. A handsome climbing shrub, with large, smooth, elliptic leaves and hooked branches. Not uncommon at Matheran.
16. Malvaceæ. (The Mallow Order.)	<i>Sida carpinifolia, Linn. Herb. Co.</i>	Chikni, Chikan kada. It "is used to make besoms, the twigs being at once supple and tough" (Lee).
"	<i>Abutilon polyandrum, Schlecht.</i>	Bhendi. Rāmbāg, Matheran. A tall, handsome annual. Flowers pale yellow; nearly 2 inches in diameter.
"	<i>Urena sinuata, Linn., DC.</i>	Matheran, common. "It is like a pink geranium with gashed leaves" (Cooke).
"	<i>Hibiscus hirtus, Linn.....</i>	On the Ghāt, Matheran.
"	<i>Thespesia Lampas, Dalz. & Gibs.</i>	Rān-bhendi, Lahān Bhen-di. Wild Bhendy. A handsome plant. Flowers large, yellow, with crimson centre.
"	<i>Kydia calycina, Roxb. ...</i>	Wārunḡ. Near drinking well on Matheran Ghāt. Flowers in November.
"	<i>Bombax malabaricum, DC.</i>	Sāvar, Tambdi Sāvar. Silk-cotton tree. Sans. Rak-ta-sālmali. The wood is "used for planking, packing cases, toys, scabbards, fishing-floats and for the lining of wells. * * The calyx of the flower-bud is eaten as a vegetable. The fruit is collected before it opens, and the cotton with which it is filled is used to stuff quilts and pillows" (Brandis).
17. Sterculiaceæ	<i>Sterculia urens, * Roxb...</i>	Kuāri.

* The *Sterculia urens*, though not common, is conspicuous on the Matheran Ghāt by its cream-coloured, pink and white, shining bark, the thin, transparent coating of which peels off "like that of the birch." Sitars (native guitars) are made of the wood. It yields a gum which is "sold under the name of *katila, katira*." The seeds are "eaten by Gonds and Kurkus in the Central Provinces." (Brandis).

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
17. Sterculiaceæ—Contd.	<i>Sterculia guttata</i> , Roxb...	Go' dar. Fruit ripens in November-December. Fruit large, peach-shaped and covered with scarlet down.
"	" <i>colorata</i> , Roxb...	Kaushi. Coral tree. The bark is "made into rope" (Brandis).
"	<i>Helicteres isora</i> , Linn. ...	Kevani, Maradsing. Matheran. Has leaves like a hazelnut bush. The ripe carpels form a brown, spirally-twisted, beaked cylinder. On FitzGerald Ghât, Mahableshwar.
"	<i>Eriolæna Stocksii</i> , H. f. & T.	Beautiful, yellow flowers. Below Chowk Point, Matheran.
18. Tiliaceæ (The Linden Order.)	<i>Grewia tiliaefolia</i> , Vahl...	Dhâman. "Made into shafts, shoulder poles for loads, pellet-bows, handles, masts, oars, employed in carriage building. From the inner bark cordage is made in Bombay. Twigs and leaves lopped for fodder. Fruit eaten, of an agreeable acid flavour" (Brandis).
"	" <i>pilosa</i> , Lam.	
"	" <i>Microcos</i> , Linn...	Tiral, Khiral, Shiral. On the FitzGerald Ghât.
"	<i>Erinocarpus Nimmoanus</i> , Grah.	Cher. Matheran Ghât, just above the second mile-stone from Neral. Fruits in October.
"	<i>Triumfetta pilosa</i> , Roth..	Kutrevândre, i.e., "Dogs and Monkeys."
"	" <i>rhomboides</i> , Jacq., Herb. Co.	Necharda.
"	<i>Elæocarpus oblongus</i> , Gaertn., Herb. Co.	Kâsu, Kâs. At Lingmala, at entrance to "Prospect Cottage" and on Panchgani Road, Mahableshwar.
19. Linææ (The Flax Order.)	<i>Linum mysorense</i> , Heyne.	Bâmburti, Wândri. Yellow Flax.
"	<i>Reinwardtia trigyna</i> , Hook.	Abai. Large-flowered, yellow flax. In gardens at Mahableshwar and Matheran.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
20. Malpighiaceæ	Hiptage Madablota, <i>Gærtn.</i>	Panchgani.
21. Geraniaceæ (The Cranesbill Order.)	Oxalis corniculata, <i>Linn.</i>	Nalkarda. Yellow sorrel.
"	Impatiens acaulis, <i>Hook.</i>	Lahán Terda, Berki. Stemless Balsam. Rare at Matheran. Not so rare at Mahableshwar, where it grows on wet rocks near streams. Plentiful on FitzGerald Ghât. It is a small and very handsome plant, with large, pale mauve flowers. "Well worthy of a place in the conservatory" (Lee).
"	" inconspicua, <i>Wall.</i>	
"	" oppositifolia, <i>Linn.</i>	Sanmukh patri, Terda.
"	" Dalzellii, <i>H. f. & T.</i>	Yellow Balsam.
"	" Balsamina, <i>Linn.</i>	Terda. Wild Balsam.
22. Rutaceæ (The Rue and Orange Order.)	Evodia Roxburghiana, <i>Benth.</i>	Tikatna, <i>i.e.</i> , "Thrice cleft." Near the Terraces on FitzGerald Ghât.
"	Toddalia aculeata, <i>Pers.</i>	Near Dhobi's waterfall, Mahableshwar. Rare.
"	Glycosmis pentaphylla, <i>Correa.</i>	Kirmira.
"	Murraya exotica, <i>Linn.</i> , var. paniculata, <i>Jack.</i>	Pándri, Kunti. Below Chowk and Hart Points, Matheran. Rare. Also below Dhobi's waterfall, Mahableshwar. A beautiful shrub, with white, fragrant flowers, like orange blossom.
"	" Koenigii, <i>Spreng.</i>	Kadhi-pák, Kadhi-nimb. Curry plant.
"	Atalantia monophylla, <i>Correa.</i>	Makadlimbu, <i>i.e.</i> , "Monkey Lime."
23. Burseraceæ (The Myrrh Order.)	Boswellia serrata, <i>Roxb.</i>	Sálpali, Sálara, Halera. Frankincense tree. On the Kartraj and Khanda Ghâts, on the road to Mahableshwar.
"	Garuga pinnata, <i>Roxb.</i> ...	Mongheri, Kadak. "Bark employed for tanning; a gum exudes from it. The fruit is eaten, raw and pickled" (Brandis). On Matheran Ghât.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
23. Burseraceæ (The Myrrh Order)— <i>Contd.</i>	<i>Canarium strictum</i> , <i>Roxb.</i>	Uc. A balsamiferous tree, yielding a gum (dhúp), burnt as incense by the hill people at their religious services. I have only seen one tree at Matheran, near the Chauki.
24. Meliaceæ (The Nimb-tree Order.)	<i>Cipadessa fruticosa</i> , <i>Blume.</i>	Naorungi. A shrub with pinnate leaves and clusters of small, round, red berries. On the old road to Mahableshwar.
"	<i>Soymdia febrifuga</i> , <i>Adr. Juss.</i>	Polára, Rohan. Bastard Cedar, Indian Redwood. "The bark is bitter, and has been used as a substitute for cinchona bark" (Brandis).
"	<i>Chickrassia tabularis</i> , <i>Adr. Juss.</i>	Kunuk. Edge of Chowk Plateau at Matheran.
"	<i>Cedrela Toona</i> , <i>Roxb.</i>	Polára. Rambag and Underwood, Matheran.
"	<i>Chloroxylon Swietenia</i> , <i>DC.</i>	Billu, Halda. Indian satin wood.
25. Olacineæ	<i>Mappia foetida</i> , <i>Miers</i>	Gánera. Mahableshwar. Well known by the offensive smell of its flowers.

SUB-CLASS 2.—CALYCIFLORE.

26. Celastrineæ (The Spindletree Order.)	<i>Celastrus paniculata</i> , <i>Willd.</i>	Kangoni. Matheran.
"	<i>Gymnosporia Rothiana</i> , <i>W. & A.</i>	Ankli.
"	" <i>emarginata</i> , <i>Roth.</i>	Between the road and the Cemetery, Mahableshwar (Nairne).
"	" <i>montana</i> , <i>Roxb.</i>	Yenkli, Ankli. The capsules are described by Hooker (vol. I, p. 621) as "numerous, with the size and look of a peppercorn," but in undried specimens the capsules are a good deal larger.
"	<i>Hippocratea Grahami</i> , <i>Wight.</i>	Yeoti. A climbing shrub, with winged brown seeds. Common at Matheran.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
27. Rhanineæ (The Buck-thorn Order.)	<i>Ventilago madraspatana</i> , <i>Gærtn.</i>	Kán-yel, Lokhandi. Common at Matheran.
"	" <i>bombaiensis</i> , <i>Dalz.</i>	Kan-yel.
"	<i>Zizyphus glabrata</i> , <i>Heyne</i>	Harkia.
"	" <i>xylopyrus</i> , <i>Willd.</i>	Guti, Ghuti, Góti Toran, Hart Point, Matheran, and on the road to Garbet Point.
"	" <i>rugosa</i> , <i>Lamk</i> ...	Toran. A prickly, climbing shrub. Fruit small, fleshy and sweet.
"	<i>Scutia indica</i> , <i>Brongn.</i>	Chimat. "Wait-a-bit" thorn. Not found at Matheran.
28. Ampelideæ (The Vine Order.)	<i>Vitis discolor</i> , <i>Dalz.</i>	Telicha-yel.
"	" <i>tomentosa</i> , <i>Heyne</i> ...	Shend-yel.
"	" <i>latifolia</i> , <i>Roxb.</i>	Nádena.
"	" <i>auriculata</i> , <i>Roxb.</i> ...	Jangli Kájorni.
"	" <i>lanceolaria</i> , <i>Roxb.</i> ...	Kazorlicha-yel.
"	<i>Leca sambucina</i> , <i>Willd.</i> ...	Dinda. Common at Matheran. Used as wattle for huts and fences. The young pinnate leaves are of a beautiful, transparent claret-colour.
29. Sapindaceæ (The Soapwort Order.)	<i>Hemigyrosa canescens</i> , <i>Thwaites.</i>	Lokhandi.
"	<i>Allophylus Cobbe</i> , <i>Blume.</i>	Tipan. Not found at Matheran. Plentiful at Mahableshwar.
"	<i>Schleichera trijuga</i> ,* <i>Willd.</i>	Kosamb, Matheran Ghât.
"	<i>Sapindus trifoliatus</i> , <i>Linn.</i>	Rhita. Soapnut. Rambag, Matheran.
"	<i>Nephelium Longana</i> , <i>Camb.</i>	Wumb. Lungáni, "Fruit the size of a cherry, reddish or purple. Aril wholesome." (Lee.) Koyna Valley.
"	<i>Turpinia pomifera</i> , <i>DC.</i> ...	Bhorambi, Chowk Plateau and Caryota grove, (Carstensen.) Drupe three-celled, pear-shaped, velvety and pinkish-grey.
30. Anacardiaceæ (The Cashewnut Order.)	<i>Mangifera indica</i> , <i>Linn.</i> ...	Amb. Mango tree.
31. Connaraceæ	<i>Connarus monocarpus</i> , <i>Linn.</i>	Sundar.

* In many parts of India, *lac* is produced on the young branches of the *Schleichera*.
 " In Oudh, this tree is lopped, and the twigs and leaves are used as cattle-fodder during the dry seasons. Oil is extracted from the seeds in South India and Ceylon" (Rendle).

Natural Order.	Genus and Species.	Verhacular or English name, use, habitat, &c.
32. Leguminosæ (The Pea, Cassia and Acacia Order.)	<i>Crotalaria vestita</i> , Baker	
"	" <i>triquetra</i> , Dalz.	Ghâti.
"	" <i>nana</i> , Burm.....	
"	" <i>retusa</i> , Linn.....	Ghâgri.
"	" <i>Leschenhaultii</i> , DC.	Dingala.
"	<i>Indigofera pulchella</i> , Roxb.	Nerda, Wild Indigo. Near Yenna Falls.
"	<i>Geissapsis cristata</i> , W. & A.	Barki.
"	" <i>tenella</i> , Benth ...	Lahân Barki.
"	<i>Zornia diphylla</i> , Pers. ...	Nâl-Barga, Berki.
"	<i>ib.</i> , var. <i>zeylonensis</i> , Pers.	Barga, Berki.
"	<i>Smithia purpurea</i> , Hook	
"	" <i>setulosa</i> , Dalz.....	Hambor.
"	" <i>blanda</i> , Wall	Mothi Berki.
"	<i>Alysicarpus vaginalis</i> , DC.,	Dhâktâ Dhâmpa.
"	var. <i>nummularifolius</i> .	
"	" <i>longifolius</i> , W. & A.	Dhâmpa.
"	<i>Desmodium Cephalotes</i> , Wall.	Lapoti. Matheran Ghât.
"	" <i>parviflorum</i> , Baker.	
"	<i>Erythrina indica</i> , Lam. ...	Pangâra, Pâranga.
"	" <i>stricta</i> , Roxb. ...	Matheran.
"	<i>Butea frondosa</i> ,* Roxb. ...	Palas, Khâkra, Sans, Palâsa. The "Flame of the Forest."
"	<i>Phaseolus trinervius</i> , † Heyne.	Mungi.
"	<i>Vigna vexillata</i> , Benth ...	Birambol, Halua, Halunda. Indian Sweet Pea.
"	<i>Atylosia lineata</i> , W. & A.	Rîn Tûr.
"	" <i>rostrata</i> , Baker...	
"	<i>Cylista scariosa</i> , Ait.	Rân Ghevda.
"	<i>Flemingia strobilifera</i> , R	Kânphuti.
"	<i>Dalbergia latifolia</i> , Roxb	Sisu, Siswa, Sisam, Tâli, Blackwood tree.
"	" <i>sympathetica</i> , Nimmo.	Pendguli-yel, Yek-yel, Ekyel.
"	" <i>volubilis</i> , Roxb....	Alei, Petungli.
"	" <i>paniculata</i> , Roxb....	Phânsi. Matheran Ghât.
"	" <i>monosperma</i> , Dalz.,	Garud-yel. Flowers in October and November, Chowk Plateau.

* The leaves of the Palas tree are given as fodder to buffaloes. The flowers are made with alum into the yellow dye used at the *Holi* festival (Brandis). This tree gives its name to the memorable plain of *Palasi*, vulgarly called "Plassey." (Graham's Catalogue and Birdwood's "Vegetable Products of the Bombay Presidency.")

† This plant is common throughout India. "The seeds, said to be rich in nitrogenous principles, were largely used by the famine-stricken people" (Dr. Lisboa's *Useful Plants*).

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
32. Leguminosæ (The Pea, Cassia and Acacia Order)— <i>Contd.</i>	<i>Pongamia glabra</i> , Vent.....	Karanj. At the Terraces, Mahableshwar. (Synmonds).
"	<i>Derris oblonga</i> , Benth.....	Karkhanditse-yel.
"	" <i>brevipes</i> , Baker ...	
"	<i>Mezoneurum cucullatum</i> , W. & A.	Vagáti, Wákéri.
"	<i>Wagatea spicata</i> , Dalz ...	Vagáti.
"	<i>Cassia fistula</i> , DC.....	Báhawa, Garmala. Indian Laburnum.
"	<i>Bauhinia racemosa</i> , Lamk.	Apta, Wanráj.
"	" <i>malabarica</i> , Roxb.	Kánchan, Panchawa.
"	" <i>Vahlíi</i> , W. & A.	Chámbuli, Chám-yel.
"	<i>Acacia Suma</i> , Kurz	Khair. <i>Catechu</i> is manufactured from the wood.
"	" <i>concinna</i> , DC.	Chikakai, Shikakai, Shemli.
"	" <i>Intsia</i> , Willd.	FitzGerald Ghât.
"	<i>Albizzia stipulata</i> , Boiv....	Lullei, Laeli, Adal.
"	" <i>amara</i> , Boiv.....	Siras, Saus, Sarshapa. Near Alexandra Point, Matheran.
33. Rosaceæ (The Rose Order.)	<i>Prunus persica</i> , Benth & Hook.f.	The Peach. Cultivated at Panchgani.
"	<i>Pygeum Gardneri</i> , Hook.f.	Kaula, Gogal, Dákha.
"	<i>Rubus moluccanus</i> , Linn.	Indian Blackberry.
"	" <i>lasiocarpus</i> , Smith.	Mahableshwar Raspberry.
"	<i>Fragaria vesca</i> , Linn. ...	Strawberry.
"	<i>Rosa multiflora</i> , Thunb.	Clustering Rose. In hedgerows, Panchgani and Mahableshwar.
"	<i>Cotoneaster frigida</i> , Wall.	Above Rambag, Matheran. Found by J. C. Anderson. Identified by J. M. Woodrow.
34. Grassulaceæ (The Stonecrop Order.)	<i>Bryophyllum calycinum</i> , Salisb.	Pánphue, Pánjád, Gae-phul, Loti, Chowk Plateau, Matheran; common at Mahableshwar.
"	<i>Kalanchoe brasiliensis</i> , Camb.	Panchgani.
35. Rhizophoræ (The Mangrove Order.)	<i>Carallia integerrima</i> , DC.	Phansi. Wild Jack-tree.
36. Combretaceæ (The Myrobolan Order.)	<i>Terminalia belerica</i> , Roxb.	Beheda, Vehela.
"	" <i>Chebula</i> ,* Retz. ...	Hirda. Chebulic Myrobolan tree.

* "The Myrobolan tree is found throughout the Satara district, but in special abundance in the Mahableshwar forests, the hill soil apparently being well suited to its growth. The fruit, the Chebulic Myrobolan of commerce, is about the size of a damson, though more pointed at one end, of a deep green colour and contains a hard seed. When dry, it becomes blackish and very hard and shrivelled. It is not edible in its natural state; but when mixed with the *Beheda* and *Avla*, the powder is taken as a stomachic and mild aperient. The fruit is much valued in tanning and dyeing. ** It is also used * in making an ink" (Dr. W. McConaghy, "Gazetteer," Vol. XIX, Appendix B, Note).

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
36. Combretaceæ (The Myrobolan Order)— Conid.	<i>Terminalia Arjuna</i> , <i>Bedd.</i>	Arjun.
"	" <i>tomentosa</i> , <i>Bedd.</i>	Ain.
"	<i>Calycopteris floribunda</i> , <i>Lamk.</i>	Bag-yel, Yakshi, Bagoli.
"	<i>Anogeissus latifolia</i> , <i>Wall.</i>	Matheran Ghât.
"	<i>Combretum ovalifolium</i> , <i>Roxb.</i>	Mâd-yel, Shendri.
37. Myrtaceæ (The Myrtle Order.)	<i>Eugenia caryophyllæa</i> , <i>Wight.</i>	Near Fountain Hotel and Carnac Point, Mahableshwar.
"	" <i>Heyneana</i> , <i>Wall.</i> ...	Koyna Valley.
"	" <i>Jambolana</i> , <i>Lamk.</i> ...	Jâmbul. <i>Sans.</i> Jambu, Jambul tree. Common everywhere.
"	<i>Eucalyptus obliqua</i> , <i>L'Herit.</i>	Stringy Bark. Introduced from Australia.
"	<i>Careya arborea</i> , <i>Roxb.</i> ...	Kumbha.
38. Melastomaceæ	<i>Memecylon edule</i> , <i>Roxb.</i> , <i>Herb. Co.</i>	Anjan. Ironwood tree. Common everywhere.
39. Lythraceæ (The Loose-strife Order.)	<i>Ammania baccifera</i> , <i>Linn.</i>	Mahableshwar heather. At Dhobi's Waterfall.
"	<i>Woodfordia floribunda</i> , <i>Salisb.</i>	Dhaura.
"	<i>Lagerstroemia parviflora</i> , <i>Roxb.</i>	Nanah, Nanya, Lendia. Benteak tree.
"	" <i>lanceolata</i> , <i>Wall.</i> ...	Bhondka, Bhondga. Fruits in the cold weather.
"	" <i>Flos-Reginæ</i> , <i>Retz.</i>	Tâman.
"	" <i>floribunda</i> , <i>Jack. var.</i> <i>cuspidata</i> , <i>Wall.</i>	Kachan. Redlands, Matheran.
40. Onagraceæ (The Evening Primrose Order.)	<i>Enothera rosea</i> ...	Mahableshwar, inside the well in Reay Garden; probably not indigenous. "It has run wild in the North-West Himalaya and in the Nilghiris" (Hooker, vol. II, p. 582).
41. Samydaceæ	<i>Casearia graveolens</i> , <i>Dalz.</i>	Bokhâd.
"	" <i>esculenta</i> , <i>Roxb.</i>	Mori.
42. Cucurbitaceæ (The Gourd Order.)	<i>Trichosanthes palmata</i> , <i>Roxb.</i>	Kaundal. A large climber. Readily identified by its clusters of spherical, scarlet, orange-streaked fruit, nearly 2 inches in diameter, and by its large, broadly lobed leaves.
"	<i>Cucumis trigonus</i> , <i>Roxb.</i> ...	Kat-yel.
"	<i>Mukia leiosperma</i> , <i>Thwaites.</i>	Khaskhas, Matheran Bryony.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
42. Cucurbitaceæ (The Gourd Order)— <i>Conte.</i>	<i>Zehneria Baueriana</i> , <i>Endl.</i>	Waráli. Mahableshwar Bryony.
"	" <i>umbellata</i> , <i>Thwaites</i>	Gomáti.
"	<i>Melothria odorata</i> , <i>H. F. & T.</i>	
43. Begoniaceæ	<i>Begonia crenata</i> , <i>Dryand.</i>	Berki.
"	<i>malabarica</i> , <i>Lamk.</i>	
44. Ficoideæ (The Fig-Marigold Order.)	<i>Mollugo hirta</i> , <i>Thunb.</i> ...	
45. Umbellifereæ (The Parsley and Hemlock Order.)	<i>Hydrocotyle rotundifolia</i> , <i>Roxb.</i>	
"	" <i>asiatica</i> , [*] <i>Linn.</i> ...	Kárvana, Khopri. Sans. Bhrábmí.
"	<i>Pimpinella monoica</i> , <i>Dalz.</i>	Bhálgá.
"	<i>Peucedanum grande</i> , <i>C. B. Clarke.</i>	Báphlí.
"	<i>Heracleum concanense</i> , <i>Dalz.</i>	Pandi, Pinda. Near Elphinstone Point.
46. Rubiaceæ (The Madder Order.)	<i>Anthocephalus Cadamba</i> , <i>Miq.</i>	Niv. Mahableshwar (Symonds).
"	<i>Adina cordifolia</i> , <i>Hook. f.</i>	Hed.
"	<i>Stephegyne parvifolia</i> , <i>Korth.</i>	Kalam, Niv. Under Per- tabgarh and near One Tree Hill and on the Ghât, Matheran. A fine tree, something like an Alder.
"	<i>Hymenodictyon excelsum</i> , <i>Wall.</i>	Porcupine Point.
"	<i>Cinchona succirubra</i> , <i>Pavon.</i>	Planted in the woods at Lingmala.
"	<i>Wendlandia Notoniana</i> , <i>Wall.</i>	Frequent below Forest Bungalow, Yenna Falls.
"	<i>Oldenlandia corymbosa</i> , <i>Linn.</i>	A small, much-branched herb, with slender pubes- cent stem and branches, linear, sessile leaves and small, white flowers. Very common at Maha- bleshwar, on the side of the paths, in October (Cooke).
"	<i>Anotis carnosa</i> , <i>Dalz.</i>	A small plant with pink flowers. The leaves smell like carrion, when crushed.
"	" <i>Ritchiei</i> , <i>Hook. f.</i>	Tilia. Flowers in Octo- ber. Small, pale, purple flowers.

* An infusion of the leaves of this plant was used by the late Dr. Bhau Daji in his treatment of leprosy. The juice of the leaves is sometimes prescribed in native medicine for epilepsy; and is also popularly believed to be a cure for stammering, and to stimulate the intellectual faculties, if taken daily.

Natural Order.	Genus and Species.	Veracul or English name, use, habitat, &c.
46. Rubiaceæ (The Mad- der Order)—Contd.	<i>Mussaenda frondosa</i> , <i>Linn.</i>	Bhakes, Sarwad. Near Simpson's Lake, Mathe- ran.
"	<i>Randia dumetorum</i> ,† <i>Lamk.</i>	Gela. The pounded bark is used for poisoning fish.
"	" <i>rugulosa</i> , <i>Thw.</i> ...	Suran. Chowk Plateau.
"	<i>Canthium didymum</i> , <i>Roxb.</i>	Sajeri.
"	" <i>umbellatum</i> , <i>Wight.</i>	Tupa. Flowers in Novem- ber. Fruits in January.
"	" <i>angustifolium</i> , <i>Roxb.</i>	Chap-yel.
"	<i>Vangueria spinosa</i> , <i>Roxb.</i>	Alu. Indian Medlar.
"	<i>Ixora nigricans</i> , <i>Br.</i>	Raekura.
"	<i>Pavetta indica</i> , <i>Linn.</i>	Phaphti, Papti. Matheran Coffee.
"	" <i>hispidula</i> , <i>W & A.</i>	
"	<i>Coffea arabica</i> , <i>Linn.</i>	Coffee. Cultivated at Panchgani.
"	<i>Psychotria truncata</i> , <i>Wall.</i>	Rare. Near Carnac Point.
"	<i>Hamiltonia suaveolens</i> , <i>Roxb.</i>	Girsao. Warra Ghât Road and Falkland Point.
"	<i>Rubia cordifolia</i> , <i>Linn.</i> ...	Itari. Indian Madder. The roots furnish the dye called "manjit" (Balfour's Botany).
47. Compositæ. (The Thistle & Dandel- ion Order.)	<i>Centratherum phyllolæ- num</i> , <i>Benth.</i>	
"	" <i>tenuë</i> , <i>Clarke.</i>	
"	<i>Lamprachænium micro- cephalum</i> , <i>Benth.</i>	
"	<i>Adenoon indicum</i> , <i>Dalz.</i> ...	Kusamb, Mothi Sonki, Kardai.
"	<i>Vernonia cinerea</i> , <i>Less.</i> ...	Mothi Sadori, Sahadevi.
"	" <i>divergens</i> , <i>Benth.</i>	Bondar. At Yenna Falls and Garbat Point.
"	<i>Elephantopus scaber</i> , <i>Linn.</i>	Charlotte Lake, Matheran.
"	<i>Adenostemma viscosum</i> , <i>Forst.</i>	Jirao, Jangli jirao, Lapcti.
"	<i>Ageratum conyzoides</i> , <i>Linn.</i>	Ganera.
"	<i>Dichrocephala latifolia</i> , <i>DC.</i>	
"	<i>Cyathocline lyrata</i> , <i>Cass.</i>	Gangotri.
"	<i>Conyza stricta</i> , <i>Willd.</i>	Gondali.
"	<i>Blumea glomerata</i> , <i>DC.</i> ...	Bhâmburda. The leaves have a strong aromatic smell.
"	" <i>Malcomii</i> , <i>Hook f.</i>	

* This showy shrub is not very common at Matheran. It can be readily identified by its conspicuous, white, calycine leaves, and its small, golden-yellow flowers.

† The *Gela* is very common on the hills. It is variable in size, sometimes a small tree, generally a shrub, with numerous stiff branches, armed with spines, and large, fragrant white flowers, slightly tinged with greenish-yellow, which turn yellow before they fade.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
47. Compositæ—Cont.	<i>Anaphalis oblonga</i> , DC....	
"	<i>Gnaphalium luteo-album</i> , Linn.	
"	<i>Vicoa cernua</i> , Dalz.....	
"	<i>Pulicaria Wightiana</i> , Clarke	Everywhere at Matheran (Macpherson).
"	<i>Wedelia urticæfolia</i> , DC.	Sonki.
"	<i>Spilanthes Acmella</i> , Linn.	
"	<i>Bidens pilosa</i> , Linn.....	
"	<i>Tridax procumbens</i> , Linn.	
"	<i>Artemisia parviflora</i> , Roxb	Dauni, Bhángi.
"	<i>Gynura nitida</i> , DC.....	Dáhn: Sow-thistle. Flowers in October.
"	<i>Notonia grandiflora</i> , DC..	Cabbage tree, Khandala Ghât, near Wai.
"	<i>Senecio Lawii</i> , Clarke.....	Not common at Matheran, but very common on a hill above Khandala (Cooke).
"	" <i>Grahami</i> , Hook. f.	Sonki.
"	" <i>belgaumensis</i> , Clarke	Very like <i>S. Grahami</i> , but has no pappus (Cooke).
"	<i>Calendula officinalis</i> , Linn.	Makmal. Marigold. Kartraj and Wai Ghâts.
"	<i>Tricholepis glaberrima</i> , DC	Motha Búr, Búr.
"	<i>Lactuca Heyneana</i> , DC...	Wild Lettuce.
48. Campanulacææ (The Hare-bell Order.)	<i>Lobelia trigona</i> , Roxb.....	
"	" <i>nicotianæfolia</i> , Heyne.	Dhával, Devnal. A tall, erect plant, with hollow stems, and large, light- green, lanceolate leaves, and a dense terminal raceme of white flowers. The leaves are smoked instead of tobacco by the hill people on the Nil- giris.
"	<i>Cephalostigma flexuosum</i> H. f. & T.	
"	<i>Wahlenbergia gracilis</i> , DC.	
SUB-CLASS 3.—COROLLIFLORE or GAMOPETALÆ.		
49. Plumbagineæ	<i>Plumbago zeylanica</i> , Linn.	Common at Mahableshwar
50. Primulacææ (The Primrose Order).	<i>Lysimachia obovata</i> , Ham.	Found by Dr. Lisboa in the Chinaman's Garden at Mahableshwar and described in a paper on the climate of Maha- bleshtar read before the Grant College Me- dical Society in 1886.
"	<i>Anagallis arvensis</i> , Linn...	Pimpernel, near Panch- gani. (Matheran).

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
51. Myrsinææ	<i>Mæsa indica</i> , Wall	Atk' Atak.
"	<i>Embelia ribes</i> , Burm. ...	Wa warang.
"	" <i>robusta</i> , Roxb., var.	Ambuti, Wawri.
"	" <i>ferruginea</i> , Wall...	
52. Sapotacææ (The Sapodilla Order.)	<i>Sideroxylon tomentosum</i> , Roxb.	Kanta-Kumbal. Common at Matheran. A hard-wooded tree. Leaves woolly.
"	<i>Bassia latifolia</i> , Roxb.....	Mavra, Mohova. Mowrah Tree. Matheran Ghât.
"	<i>Mimusops Elengi</i> , Linn...	Bokul, Bakuli. Below Simpson Lake, Matheran.
53. Ebenacææ (The Ebony Order.)	<i>Diospyros montana</i> , Roxb.	Goinda.
"	" <i>assimilis</i> , Bedd.	Malia. Indian Ebony.
54. Styracææ	<i>Symplocos Beddomei</i> , Clarke.	Kaola. Mahableshwar, common.
55. Oleacææ (The Olive Order.)	<i>Jasminum arborescens</i> , Roxb., var. <i>latifolia</i> .	Kusar. Wild Jasmine.
"	<i>Olea dioica</i> , Roxb.....	Pâr Jamb. Wild Olive.
"	<i>Ligustrum neilgherrense</i> , Wight.	Lokhandi, Mersinga. Mahableshwar Privet. Not found at Matheran.
56. Apocynacææ (The Dogbane Order.)	<i>Carissa Carandas</i> , Linn.	Karvand, Corinda. The well-known Corinda Bush.
"	<i>Rauwolfia densiflora</i> , Benth., Herb. Co.	Rare. At Lingmala. (Cooke).
"	<i>Holarrhena antidysenterica</i> , Wall.	Kuda. Pândhra Kuda. Sans. Kutaja. The seed is called Indrajava (Sans. Indrayava), and is used as a vermifuge and febrifuge.
"	<i>Tabernaemontana dichotoma</i> , Roxb.	Taital.
"	" <i>crispa</i> , Roxb.	Taital. Fruit well formed in November.
"	<i>Wrightia tinctoria</i> , Br. ...	Kâla Kuda.
"	<i>Anodendron paniculatum</i> , A. DC.	Lâmtâni. Dr. MacDonald's "Seed Traveler." See the Society's Journal, vol. I, p. 237.
57. Asclepiadææ (The Milkweed Order.)	<i>Calotropis gigantea</i> , Br...	Rui.
"	<i>Gymnema silvestre</i> , Br...	Kaoli, Pitâni, Dodi, Dudh-rolî, Sirdoli.
"	<i>Dregea volubilis</i> , Benth. Herb. Co.	Kaoli.

* The leaves of this climber have the property, when chewed, of neutralizing for a time the taste of saccharine substances. It may be identified by its slender green branches and numerous dense umbels of yellowish-green flowers rather than by its most common vernacular name, Kaoli, which is applied to many of the twining asclepiads. (Cooke).

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
57. Asclepiadaceæ (The Milkweed Order.) —Contd.	<i>ib. var. angustifolia</i>	Dudhi. Near the top of the Rotunda Ghât and at Babington Point, Mahableshwar. The root is given uncooked as medicine for guinea-worm.
"	..... <i>Dischidia benghalensis</i> , <i>Coleb.</i>	
"	..... <i>Hoya retusa</i> , <i>Dalz</i>	Dhákhti Ambri. Golden Fringe.
"	..... " <i>Wightii</i> , <i>Hook f.</i> ...	Ambri, Dudh-yel. Wax plant.
"	..... <i>Leptadenia reticulata</i> , <i>Wight & Arn.</i>	Khár-Khodi.
"	..... <i>Ceropegia Lawii</i> , <i>Hook f.</i> ..	Near the Bund, Mahableshwar. Flowers in July (Nairne).
58. Loganiaceæ (The Strychnia Order.)	<i>Buddleia asiatica</i> , <i>Lour.</i> , <i>Herb. Co.</i>	Very rare. Lingmala and FitzGerald Ghât (Cooke).
"	..... <i>Strychnos colubrina</i> , <i>Linn.</i>	Tarali. Strychnine Creeper. Near Simpson Lake, Matheran. Plentiful below cliffs to the south of Chowk Plateau.
"	..... " <i>potatorum</i> , <i>Linn. f.</i>	Niwali, Nirmali. Near Hart Point, Matheran.
59. Gentianaceæ (The Gentian Order.)	<i>Exacum bicolor</i> , <i>Roxb.</i> ...	
"	..... " <i>Lawii</i> , <i>Clarke</i> ...	Jatáli, Gaulan. Mahableshwar Gentian. Very common amongst grass in October; dies very soon after the end of the rains (Cooke). The whole plant turns red when dried.
"	..... " <i>petiolare</i> , <i>Griseb.</i>	Matheran.
"	..... <i>Canscora diffusa</i> , <i>Br.</i>	Galphugi, Shinta, Mahtára chá gavat. Common along shady roadsides, both at Matheran and Mahableshwar (Cooke). Grows to 3 or 4 ft. high in the Rambag, and when dry, after seeding, the whole plant is of a reddish colour.
"	..... <i>Swertia decussata</i> , <i>Nimmo</i>	Kauri. Flowers in November in grassy places. Used as a febrifuge (Cooke).
60. Boraginaceæ (The Borage Order.)	<i>Cordia myxa</i> , <i>Linn</i>	Bhokar. Rambag, Matheran.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
60. Boraginæ (The Borage Order)— <i>Contd.</i>	<i>Ehretia laevis</i> , <i>Roxb.</i>	B'lokar. Foot of Matheran Ghât.
"	<i>Trichodesma zeylanicum</i> , <i>Br.</i>	Matheran.
"	<i>Paracaryum caelestinum</i> , <i>Benth.</i>	Nechurdi. Mahableshwar "Forget-me-not." Common everywhere.
"	" <i>malabaricum</i> , <i>Clarke.</i>	On the Bund, Mahableshwar. Distinguished by its large, dark, metallic-blue flowers.
"	" <i>Lambertianum</i> , <i>Clarke.</i>	FitzGerald Ghât. Distinguished by its smooth nutlets, which are not reflexed or barbed as in <i>P. caelestinum</i> .
61. Convolvulacæ (The Convolvulus Order.)	<i>Argyrea speciosa</i> , <i>Sweet.</i>	
"	" <i>sericea</i> , <i>Dalz.</i> ...	Gavel.
"	" <i>malabarica</i> , <i>Chois.</i>	
"	<i>Lettsomia elliptica</i> , <i>Wight.</i>	FitzGerald Ghât.
"	" <i>setosa</i> , <i>Roxb.</i> ...	Galdar, Sámbar-yei.
"	<i>Ipomæa dissecta</i> , <i>Willd.</i> ...	
"	<i>Porana malabarica</i> , <i>Clarke</i>	Bhauri. Flowers in October and November in many parts of Mahableshwar, and along the Garbet Road, Matheran. Flowers small, funnel-shaped, pure white. "The dry scarious calyx is often seen on the withered plants in the hot season" (Cooke).
62. Solanacæ (The Potato Order.)	<i>Solanum nigrum</i> , <i>Linn.</i> ...	Kámani. Common in gardens below the bazaar, and below the lake, Mahableshwar (Cooke).
"	" <i>denticulatum</i> , <i>Blume.</i>	Karad Kángoni.
"	" <i>giganteum</i> , <i>Jacq.</i>	Kutri.
"	" <i>indicum</i> , <i>Linn.</i>	Chiturti, Bhui-vángi.
"	<i>Nicandra physaloides</i> , <i>Gertn.</i>	Kartraj Ghât. Mr. Macpherson has found it also in the Koyna Valley, between Sidney and Elphinstone Points.
"	<i>Datura fastuosa</i> , <i>Linn., var. alba.</i>	Dhotra.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
62. Solanaceæ (The Potato Order.)— <i>Cont.</i>	<i>Brugmansia candida</i>	Motha Dhotra. The Spanish "Dama de Noche." Not described in Hooker's "Flora of British India"; nor probably indigenous. It has been planted on the FitzGerald Ghât and other roads and grows freely. Readily identified by its long, drooping, tubular, white flowers, which smell sweetly at nightfall; hence the Spanish name "Lady of the Night."
63. Scrophularinæ (The Figwort Order.)	<i>Celsia coromandeliana</i> , Vahl.	On the Wai Ghât (Macpherson).
"	<i>Limnophila racemosa</i> , Benth.	Mâhâka.
"	" <i>gratioloides</i> , Br.	Tûrti.
"	<i>Herpestis Monniera</i> , H. B. & K.	Flowers in April and May.
"	<i>Bonnaya veronicæfolia</i> , Spreng.	Shewâl.
"	<i>Striga orobanchioides</i> , Benth.	Tâmbdi Karicha gavat.
"	<i>Ramphicarpa longiflora</i> , Benth.	Matheran.
"	<i>Centranthera hispida</i> , Br.	Matheran.
"	<i>Sopubia delphinifolia</i> , G. Don.	Louisa Point. Flowers in October.
"	<i>Pedicularis zeylanica</i> , Benth.	
64. Lentibulariaceæ (The Bladderwort Order.)	<i>Utricularia albo-cærulea</i> , Dalz.	Kâjutchâ-ghâs. Not very common. Grows in patches in the wet grass near the Dhobi's Waterfall, Mahableshwar.
"	" <i>cærulea</i> , Linn. ..	Bladder-wort.
65. Gesneraceæ (The Gesnera Order.)	<i>Æschynanthus Perrottetii</i> , A. DC.	Found on the bank of the Koyna, but not at Mahableshwar itself. Flowers in October (Cooke).
66. Bignoniaceæ (The Trumpet Flower Order.)	<i>Heterophragma Roxburghii</i> , DC.	Wâras. There are some fine trees of this species on the western path to Chowk plateau, Matheran.

* This strange-looking little plant may be readily identified by its dark, reddish-purple stem and branches, its scale-like leaves, and its terminal spikes of pink flowers, which have a white spot at the base of each division of the corolla. It grows on rocks, and is sometimes parasitical on the roots of other plants. It flowers in October and November.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
66. Bignoniaceæ (The Trumpet Flower Order.)— <i>Contd.</i>	<i>Heterophragma adeno-phyllum</i> , <i>Seem.</i>	Pádel. Near the chauki, Matheran.
67. Acanthaceæ (The Acanthus Order.)	<i>Thunbergia fragrans</i> , <i>Roxb.</i>	Eri-yél.
"	<i>Hygrophila Serpyllum</i> , <i>T. Anders.</i>	Rán-tewan.
"	<i>Strobilanthes asperimus</i> , <i>Nees.</i>	Kárví. Meni Karvo.
"	" <i>Heyneanus</i> , <i>Nees.</i>	Indian Wattle.
"	" <i>ixiocephalus</i> , <i>Benth.</i>	Ankra, Itari.
"	" <i>scrobiculatus</i> , <i>Dalz.</i>	Kárva, Dármori. Said to flower only once in 7 years. The same is said of <i>S. asperimus</i> , which also is said to flower the year after <i>S. ixiocephalus</i> .
"	" <i>callosus</i> , <i>Nees.</i>	"Corolla symmetric pale below, a beautiful blue upwards..... Appears to be the most beautiful species of the genus" (Hooker, vol. IV, p. 445.)
"	" <i>asper</i> , <i>Wight.</i>	Below Chowk Point.
"	" <i>perfoliatus</i> , <i>T. Anders.</i>	Meni Karvo; Chit Karo. Matheran, near Little Chowk Point. Flowers in Oct. Bracts shining white; sometimes rosy at tips.
"	<i>Calacanthus Dalzelliana</i> , <i>T. Anders.</i>	Waiti. Very common at Matheran. It flowers triennially; flowers pale blue. The spikes when dry are highly aromatic.
"	<i>Dædalacanthus purpurascens</i> , <i>T. Anders.</i>	Pandhra Karva. Flowers large, purple. Under wet rocks below the chauki, Matheran (Cooke).
"	<i>Hemigraphis latebrosa</i> , <i>Nees.</i>	Matheran.
"	<i>Phayloopsis parviflora</i> , <i>Willd.</i>	Koyna Valley. (Macpherson).
"	<i>Blepharis asperima</i> , <i>Nees.</i>	Dikna.
"	<i>Haplanthus verticillaris</i> , <i>Nees.</i>	Kála Kírá, Kála Ankra.
"	<i>Barleria Prionitis</i> , <i>Linn.</i>	Pivla Itari. Common at Matheran. Flowers yellow.
"	" <i>Gibsoni</i> , <i>Dalz.</i>	Gura. Matheran. Ghát. Tubes of flowers white; limb pale lilac.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
67. Acanthaceæ (The Acanthus Order.) Contd.	<i>Barleria grandiflora</i> , Dalz.	Safed Itari. Matheran. Flowers large, white.
"	" <i>courtallica</i> , Nees.	Itari.
"	" <i>strigosa</i> , Willd., var. <i>terminalis</i> .	Koránti, Kali Itari. Flowers blue, the tube of the corolla much paler than the limb. Stigma purple. A handsome, showy plant. Plentiful on FitzGerald Ghât; and near Hart Point, Matheran.
"	<i>Asystasia violacea</i> , Dalz...	Akra. Very common at Mahableshwar in Octo- ber.
"	<i>Lepidagathis cuspidata</i> , Nees.	
"	<i>Rungia parviflora</i> , Nees.	
"	<i>Dicliptera zeylanica</i> , Nees.	
"	<i>Justicia Betonica</i> , Linn ...	Matheran (Carstensen).
"	" <i>trinervia</i> , Vahl...	Sûta, Pandhra Suta.
"	" <i>procumbens</i> , Linn.	Tharambal.
"	<i>Adhatoda vasica</i> , Nees ...	Adulsa. A very common shrub. Used for hedges in the Ghât districts (Nairne).
"	<i>Ecboium Linneanum</i> , Kurz.	Dhákta-adulsa, Kala Suta, Wálio. Godra.
68. Verbenaceæ The Vervain Order.)	<i>Lantana Camara</i> , Linn ...	In hedges, Panchgani. The plant "has a strong smell of black currants" (Nairne).
"	<i>Priva leptostachya</i> , Juss.	Below Kate's Point (Mac- pherson.) I have found it with blue flowers on Louisa Point. The flowers are ordinarily white.
"	<i>Callicarpa lanata</i> , Linn ...	Yesur.
"	<i>Tectona grandis</i> , Linn. ...	Ság, Ságwán. Teak tree.
"	<i>Premna coriacea</i> , Clarke	
"	" <i>purpurea</i> <i>sensu</i> <i>Thwaites</i> .	Chámbar-yel.
"	<i>Gmelina arborea</i> , Linn. ...	Shewan. The pale yellow, close-grained wood of this tree is highly esteem- ed for planking, furni- ture, the panels of doors, &c. (Nairne).

Natural Order.	Genus and Species.	Vegetacular or English name, use, habitat, &c.
68. Verbenaceæ (The Vervain Order)— <i>Contd.</i>	<i>Vitex</i> Negundo, <i>Limn. Herb Co.</i>	Ketri, Nigud, Nigadi, <i>Limn.</i> Nirgundi. In native medicine, the bruised leaves are applied to the temples, as a cure for headache. (Cooke.) In <i>var. incisa</i> , the leaflets are crenate and serrate, and are not nearly so white underneath as in the more common plant.
"	<i>ib. var. incisa, Lamk.</i>	
"	<i>Vitex leucoxydon, Linn...</i>	Koyna Valley (Cooke).
"	<i>Clerodendron serratum, Spreng., Herb. Co.</i>	Borungi, Borsangi, Bhārang. Near the dharmasala, between Mahableshwar and Panchgani.
69. Labiatae (The Labiate or Dead-Nettle Order.)	<i>Plectranthus</i> Wightii, <i>Benth.</i>	Lingmala and elsewhere.
"	<i>Coleus parviflorus, Benth.</i>	Khāpri. Near Elphinstone Point, Mahableshwar.
"	<i>Lavandula Gibsoni, Grah.</i>	Indian Lavender. On the Wai Ghāt.
"	<i>Pogostemon paniculatus, Benth.</i>	
"	<i>" parviflorus, Benth.</i>	Pāngli. The stem and leaves of this plant are used in the Ratnagiri District as a cure for snake-bite.
"	<i>Dysophylla myosuroides, Benth.</i>	Shewal.
"	<i>" salicifolia, Dalz.</i>	
"	<i>" stellata, Benth.</i>	Marvá.
"	<i>" gracilis, Dalz.</i>	
"	<i>Colebrookia oppositifolia, Smith.</i>	Bhāman.
"	<i>Micromeria capitellata, Benth.</i>	Karwat. "Very aromatic" (Hooker).
"	<i>Salvia plebeia, Br.</i>	Birambola.
"	<i>Scutellaria discolor, Coleb.</i>	
"	<i>Anisomeles Heyniana, Benth.</i>	Chaudhāra. Common everywhere.
"	<i>" ovata, Br.</i>	

* *Dysophylla gracilis* is probably only a tall form of *D. stellata*. (Hooker, vol. IV, p. 641.) The latter plant can be readily known, when in flower in October, by its narrow, linear, whorled leaves, and its slender spikes of minute, closely-packed, dark purple flowers. It grows in patches on the roadside near Sydney Point, Mahableshwar.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
69. Labiatae (The Labiate or Dead-Nettle Order.)— <i>Contd.</i>	<i>Anisomeles malabarica</i> , Br.	On the Katraj Ghât. Flowers in November. This beautiful plant can be readily identified by the snow-white, appressed wool which clothes its stem and branches, by its large thick leaves, and its dense whorls of pale purple flowers.
"	... .. <i>Leucas stelligera</i> , Wall....	Guma, Borambi, Mátasúl.
"	..... " <i>ciliata</i> , Benth.....	Borambi, Mahableshtar Dead Nettle. Flowers in the cold season. Not so common as <i>L. stelligera</i> . May be identified by the short, dense, yellowish brown hairs on the helmet-shaped upper lip of the corolla (Cooke).
"	..... <i>Teucrium tomentosum</i> , Heyne.	
SUB-CLASS 4.—MONOCHLAMYDEÆ or APETALÆ or INCOMPLETEÆ.		
70. Plantagineæ (The Rib-grass Order.)	<i>Plantago major</i> , Linn.....	English plantain.
71. Amarantaceæ (The Amaranth Order.)	<i>Celosia argentea</i> , Linn.....	Kúrdú. Quail grass.
"	..... <i>Achyranthes aspera</i> , Linn.	Saráta. Burr plant.
"	..... <i>Alternanthera sessilis</i> , Br.	
72. Chenopodiaceæ (The Goose-foot Order.)	<i>Chenopodium ambrosoides</i> , Linn.	Sherni.
73. Polygonaceæ (The Buck-wheat Order.)	<i>Polygonum plebejum</i> , Br., var. <i>elegans</i> .	
"	..... " <i>glabrum</i> , Willd.	Sheral. Near the lake, Mahableshtar, with the next species.
"	..... " <i>barbatum</i> , Linn.	Dhákta Sheral.
"	..... " <i>alatum</i> , Ham. ...	
"	..... " <i>chinense</i> , Linn....	Nárali, Paral. Indian Buck-wheat.
74. Piperaceæ (The Pepper Order.)	<i>Piper Hookeri</i> , Miq.	Ran Mirwal, Hill Pepper.
"	..... " <i>sylvestre</i> , Lamk. ...	
"	..... <i>Peperomia portulacoides</i> , A. Dietr.	
75. Myristiceæ (The Nutmeg Order.)	<i>Myristica attenuata</i> , Wall.	Rakht Rúra. Rambag. Matheran Nutmeg.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
76. Laurineæ (The Laurel Order.)	<i>Cryptocarya Wightiana, Thwaites.</i>	Pan̄hawa, Bobarsa.
"	<i>Beilschmiedia fagifolia, Nees.</i>	Matheran (Cooke).
"	<i>Dehaasia cuneata, Blume.</i>	Sirsa. Matheran.
"	<i>Cinnamomum Tamala, Nees.</i>	Maharuk. Below cliffs on south of Chowk Plateau. Only four trees have been seen. Fruit ripens in May.
"	<i>Machilus villosa, Hook. f.</i>	
"	" <i>macrantha, Nees</i>	Gulumb. The petiole is generally twisted through an angle of 90°.
"	<i>Alseodaphne semicarpifolia, Nees.</i>	Bobarsa. In the Cemetery, Matheran.
"	<i>Actinodaphne Hookeri, Meison. Syn. A. lanceolata, Herb. Co.</i>	Pisa. Common everywhere.
"	<i>Litsea Cookii</i>	Near Carriage Stand, Arthur's Seat.
"	" <i>tomentosa, Heyne.</i>	Rotanda Ghât.
"	" <i>polyantha, Juss</i>	Kala Pisa. Arthur's Seat and near Government House, Mahableshwar. The leaves smell of cinnamon, when crushed.
"	" <i>Stocksii, Hook. f.</i>	
"	" <i>Wightiana, Wall.</i>	Below Bombay Point, Mahableshwar. (Symonds.)
"	" <i>fusca, Thwaites.</i>	
"	" <i>zeylanica, C. & Fr. Nees.</i>	
77. Thymelæaceæ (The Spurge Laurel Order.)	<i>Lasiosiphon eriocephalus, Dene.</i>	Rameta. Plentiful on both hills. The bark, which has a strong fibre, is used by the hill coolies for tying bundles of grass and wood. Used also for poisoning fish.
78. Elæagnaceæ (The Oleaster Order.)	<i>Elæagnus latifolia,* Linn.</i>	Ambulgi.

* This beautiful species is very variable in habit, taking the form of either a bush, a small tree, or a climber (Hooker). At Matheran and Mahableshwar it is generally found as a large climber, and is readily identified by its oblong, elliptic leaves, which are silvery-white beneath.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
79. Loranthaceæ (The Mistletoe Order.)	<i>Loranthus Wallichianus, Schultz.</i>	The name Bānda or Vānda is commonly given by the Hill people to all these parasitic plants.
"	" <i>obtusatus, Wall...</i>	
"	" <i>scurrula, Linn</i>	
"	" <i>pulverulentus, Wall.</i>	
"	" <i>cuneatus, Heyne...</i>	
"	" <i>elasticus, Desrousse.</i>	
"	" <i>involucratus, Roxb.</i>	Bandguli.
"	" <i>lageniferus, Wight.</i>	Bandguli. Involucre 5-lobed, lurid purple, long tubular corolla, of light colour, anthers exerted.
"	" <i>Ioniceroides, Linn.</i>	
"	<i>Viscum angulatum, Heyne</i>	Jalindar. Indian Mistletoe.
80. Santalaceæ (The Sandalwood Order.)	<i>Osyris arborea, Wall</i>	Total.
81. Balanophoreæ	<i>Balanophora indica, Wall.</i>	For a description of this strange plant, see Mrs. Hart's "Note on a supposed Root-Parasite found at Mahableshwar in October, 1885." (Journal, vol. I, p. 75.)* The plant is found in the wood above the Dhobi's Waterfall in November.
82. Euphorbiaceæ (The Spurgewort Order.)	<i>Euphorbia pycnostegia, Boiss.</i>	
"	" <i>elegans, Spreng</i>	The bracts are about half an inch long.
"	" <i>hypericifolia, Linn</i>	Dudh mogra.
"	" <i>neriifolia, Linn ...</i>	Thor. The Candelabrum tree.
"	" <i>fusiformis, Ham...</i>	Kirkind. Roots large, ten inches long. Leaves fleshy, radiant, reddish. The flowers appear in delicate pink cymes before the leaves. Common on the Golf Ground, Mahableshwar, and on the Ghát Plateau, Matheran.

* The late Mr. W. E. Hart gave the following description, from memory, of the specimens collected by him. "My specimens approach the description of *B. indica* nearer than any of the others." (See Hooker, vol. V, pp. 237, 238.) "The root-stock was tuberous or warty. The peduncle-scales yellowish.*** They lay close on the peduncle, and ** were imbricate, but separated at the upper extremities. The heads were certainly globular and uni-sexual; reddish-brown in colour. The flowers were dioecious, white in colour. The stamens of the male flower united into a central column of conical shape. The peduncles were of all lengths, from 1 to 6 inches high, and decidedly thick for their length. The heads were of all sizes from marbles to bagatelle balls."

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
82. Euphorbiaceæ (The Spurgewort Order.)— <i>Contd.</i>	Euphorbia Rothiana, Spreng.	Dudhi.
"	Bridelia retusa, Spreng ...	Hasána, Asána. Fruits in the cold weather.
"	Phyllanthus Emblica, Linn.	Awal, Gooseberry tree.
"	" maderaspatensis, Linn.	Kanocha.
"	Glochidion lanceolarium, Dalz.	Bhoma.
"	Flüggea Leucopyrus, Willd.	Pandharphali.
"	Breynia patens, Benth.....	
"	Sauropus quadrangularis, Muell.	Chickli.
"	Croton reticulatus, Heyne.	Pandurai.
"	" Lawianus, Nimmo.	Borambi, Bhorambi.
"	" ramiflorus, Grah...	Kávala, Parai.
"	Blachia denudata, Benth.	Shindola.
"	Mallotus philippinensis, Muell.	Rohen, Asli. Capsules covered with a red, mealy powder, used as a red dye (Dalzell and Gibson). At Mount Abu, in October, this tree can be at once identified by this red powder, which colours the whole tree. I have never noticed it in the few specimens seen at Matheran or Mahableshwar.
"	Macaranga Roxburghii, Wight.	Chandára. A very common tree at Matheran. Readily identified by its large ovate peltate leaves. Grows well in Bombay.
"	Homonoia riparia, Lour ...	In the bed of the ravine below the Dhobi's Waterfall (Cooke).
"	Tragia involucrata, Linn...	Kúlti. Sting-Nettle Creeper
83. Urticaceæ (The Nettle Order.)	Trema orientalis, Blume...	Gol, Ghol.
"	Morus alba, Linn.	Situt, Shah-tut, i.e., "The King's Mulberry."
"	Ficus bengalensis, Linn...	Wad, Banyan tree. Below Chowk Point.
"	" tomentosa, Roxb. ...	Karwat.
"	" retusa, Linn.,	Nándruk, Ranekuit.
"	" Rumphii, Blume. ...	Pahir.
"	" religiosa, Linn. Var.	Ashta, * Ashit.

* The Ashta is distinguished by the hill people from the Pipal of the plains, of which it is perhaps a variety. The name "Ashta" has no connection, apparently, with the Sanskrit name of the Pipal, "Ashvatth."

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
83. Urticaceæ (The Nettle Order.)— <i>Contd.</i>	<i>Ficus infectoria</i> , <i>Roxb.</i> ...	Kel.
"	" <i>heterophylla</i> , <i>Linn.</i>	Karoti. The leaves are very rough and can be used as sand-paper.
"	" <i>asperrima</i> , <i>Roxb.</i>	
"	" <i>hispida</i> , <i>Linn.</i>	
"	" <i>palmata</i> , <i>Fors</i> ...	This is the most common fig at Mahableshwar (Cooke).
"	" <i>glomerata</i> , <i>Roxb.</i> ...	Umbar. <i>Sans.</i> Udumbar. The Sycamore tree of the Bible.
"	<i>Artocarpus integrifolia</i> , <i>Linn.</i>	Phanas. <i>Sans.</i> Panasa. Jack-tree.
"	<i>Fleurya interrupta</i> , <i>Gaud.</i>	Khājoti.
"	<i>Girardinia heterophylla</i> , <i>Dene.</i>	Mothi Khājoti, Agia, Agarra. Giant Sting-nettle.
"	<i>Lecanthus Wightii</i> , <i>Wedd.</i>	
"	<i>Boehmeria platyphylla</i> , <i>Don</i> , var. <i>scabrella</i> , <i>Wedd.</i>	
"	<i>Debregeasia velutina</i> , <i>Gaud.</i>	
83a. Casuarinæ	<i>Casuarina equisetifolia</i> , <i>Forst.</i>	Cassowary tree, Beefwood. Extensively planted at Panchgani, where it grows well.
83b. Cupuliferæ (The Hazel and Oak Order.)	<i>Quercus Robur</i> , <i>Linn.</i> ...	The Oak. There are some well-grown trees, (raised from acorns brought by the late Dr. John Wilson, from Scotland,) at Sindola, Mahableshwar.
84. Salicinæ (The Willow Order.)	<i>Salix tetrasperma</i> , <i>Roxb.</i> ...	Walunj. Willow. Not at Matheran.

Section (2)—*Gymnospermæ*.^{*}

SUB-CLASS 5.—GYMNOSPERMÆ.

85. Gnetaceæ (The Jointed-Fir Order.)	<i>Gnetum scandens</i> , <i>Roxb.</i> ...	Wumbli.
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CLASS II.—MONOCOTYLEDONES or ENDOGENS. †

86. Hydrocharideæ (The Frog-bit Order.)	<i>Vallisneria spiralis</i> , <i>Linn.</i> ...	
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* In the section "*Gymnospermæ*" the ovules are naked, i.e. not enclosed in an ovary.

† In the seeds of Monocotyledones there is generally only one cotyledon. If there are two, they alternate with each other. The Monocotyledones are also angiosperms.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
87. Burmanniaceæ	<i>Burmannia cœlestis</i> , Don.	On the road to the Governor's Bund, Matheran.
88. Orchideæ (The Orchis Order.)	<i>Oberonia recurva</i> , Lindl...	
"	<i>Microstylis Rheedii</i> , Wight	Very like a plantago.
"	<i>Dendrobium Macraei</i> , Lindl	Koyna Valley.
"	" microbulbon,	
"	A. Rich.	
"	chlorops,	
"	Lindl.	
"	barbatulum,	
"	Lindl.	
"	ramosissimum, Wight.	
"	Pierard,	Mahableshwar (Cooke).
"	Roxb.	
"	Lawanum,	Bechu, Nangli.
"	Lindl.	
"	<i>Cirrhopetalum fimbriatum</i> , Lindl.	The "Umbrella orchis;" so named by Mrs. Jerdon.
"	<i>Eria braccata</i> , Lindl.	
"	<i>Phajus albus</i> , Lindl.	
"	<i>Eulophia pratensis</i> , Lindl.	Ambarkhand.
"	<i>Ærides maculosum</i> , Lindl.	Rukhsing, Pansing. This is the handsome, sweet-scented orchid which flowers so abundantly in May.
"	" crispum, Lindl.	
"	<i>Habenaria grandiflora</i> , Lindl.	Mahableshwar. Common after the first fall of rain. Flowers with white pectinate petals. The root is the Indian "Salep Misri" of the bazaars.
"	" <i>Susannæ</i> , Br...	Wag-chaora, i.e., "Tiger's claws." The Giant orchis. Only one plant of this magnificent orchis has been found (by Dr. Cooke) at Mahableshwar. It is "plentiful on the Bhoma Hill" at Khandala. (R. M. Dixon.)

* An interesting account of this orchis is given in Mr. Dixon's Note at page 328 of Vol. X of the Society's Journal.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
88. Orchideæ (The Orchis Order.)— <i>Ch.</i>	<i>Habenaria plantaginea</i> , <i>Lindl.</i>	Matheran.
"	" <i>subpubens</i> , <i>A. Rich.</i>	Kalābi.
"	" <i>crassifolia</i> , <i>A. Rich.</i>	A. Mahableshwar. Common in September.
"	" <i>stenostachya</i> , <i>Benih.</i>	Matheran.
"	" <i>Wightii</i> , <i>Trimen</i>	Matheran.
89. Scitamineæ (The Ginger Order.)	<i>Curcuma Zedoaria</i> , <i>Rosc.</i>	Kachora, Kachola.
"	" <i>montana</i> , <i>Rosc.</i>	Rān-haldi, White turmeric.
"	<i>Hitchenia caulina</i> ,* <i>Baker.</i>	Chāvar. Arrowroot.
"	<i>Hedychium coronarium</i> , <i>König.</i>	Near Yenna stream, above Lingmala.
"	<i>Ib. var. flayum</i> , <i>Roxb.</i> ...	Sontuka, Dulab Champa. The fragrant, yellow flowers appear soon after the first fall of rain at Mahableshwar (Lisboa).
"	<i>Zinziber macrostachyum</i> , <i>Dalz.</i>	Sheri, Nisam, Wild ginger.
"	<i>Musa rosacea</i> , <i>Jacq.</i>	Rān-kei, Chāwankel, Kawadar. Wild plantain.
90. Amaryllideæ (The Amaryllis Order.)	<i>Curculigo orchioides</i> , <i>Gærtn.</i>	Kajuri.
"	" <i>malabarica</i> , <i>Wight</i>	
"	<i>Crinum asiaticum</i> , <i>Linn.</i>	
"	" <i>brachynema</i> , <i>Herb.</i>	Mahableshwar Lily.
"	<i>Pancratium parvum</i> , <i>Dalz.</i>	Khandālu, Dhapa.
91. Dioscoreaceæ (The Yam Order.)	<i>Dioscorea pentaphylla</i> , <i>Linn.</i>	Shend-vel, Shendon-vel.
"	" <i>sativa</i> , <i>Linn.</i> ...	Godri, Komphal, Yam. Commonly cultivated.
"	" <i>bulbifera</i> , <i>Linn.</i> ...	Kadu-karanda. With brown bulbs in the axils of the leaves, which, with the roots, are eaten as a vegetable, boiled or fried (Lisboa).
92. Liliaceæ (The Lily Order.)	<i>Smilax macrophylla</i> , <i>Roxb.</i>	Got-vel.
"	<i>Asparagus racemosus</i> , <i>Willd.</i>	Ashwal, Asparagus creeper.
"	<i>Chlorophytum breviscapum</i> , <i>Dalz.</i>	Kula, Kulachi baji.
"	" <i>orchidastrum</i> , <i>Lindl.</i>	

* The *Hitchenia caulina*, from which arrowroot has been obtained, grows abundantly everywhere at Mahableshwar. It flowers from June to October, and seeds freely in November.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
92. Liliaceæ (The Lily Order.)— <i>Contd.</i>	<i>Scilla indica</i> , <i>Baker</i>	A small lily, readily known by its racemes of greenish-purple flowers, which appear everywhere at Mahableshwar on the first fall of rain, at the end of May and early in June.
"	<i>Iphigenia indica</i> , <i>Kunth</i> .	
93. Commelinaceæ (The Spider-wort Order.)	<i>Commelina nudiflora</i> , <i>Linn.</i>	Gandolgi.
"	<i>Aneilema Loureirii</i> , <i>Hance</i> .	Kāju, Spider-wort.
"	<i>Cyanotis axillaris</i> , <i>Roem. & Sch.</i>	Dhākti Kāju.
34. Palmæ (Palms.)...	<i>Caryota urens</i> , <i>Linn.</i>	Bherli-mād, Fish-tail Palm. The long, trailing, fruit racemes of this palm are likened by the Hill people to the flowing locks of the long-haired Bheravs, attendants of Shiv. Hence the name "Bherli mād."
95. Aroidæ (The Arum Order.)	<i>Cryptocoryne Roxburghii</i> , <i>Schott</i> .	
"	<i>Arisoema Murrayi</i> , <i>Hook.</i>	Sāmpacha khānda, <i>i.e.</i> "Snakeroot." Cobra Lily. At Mahableshwar, where this beautiful arum appears everywhere on the first approach of the monsoon, it has a creamy white spathe, tinged with deep purple or pale green. Plants taken to Poona increase in size and show only a green spathe.
"	<i>Amorphophallus campanulatus</i> , <i>Roxb.</i>	Suran, Common at Matheran. The stock is eaten as a vegetable, boiled, and mixed with the fruit of <i>Garruga pinnata</i> and Tamarinds (Lisboa).
"	<i>Synantherias sylvatica</i> , <i>Schott</i>	

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
95. Aroidæ (The Arum Order).— <i>Contd.</i>	<i>Thomsonia nepalensis</i> , Wall. <i>syn. Pythonium Wallichianum</i> , Schott.	Shevali. The plant known as "Shevali" is considered by Dr. Lisboa to be identical with <i>Amorphophallus commutatus</i> , Engler. Dr. Kirtikar, however, agrees with the late Dr. Dymock in identifying it with <i>Pythonium Wallichianum</i> . See the notes at pages 524—528 of this Volume.
"	<i>Remusatia vivipara</i> , Schott.	Rokh-álu. Wild Caladium.
96. Lemnaceæ (The Duck-weed Order.)	<i>Lemna trisulca</i> , Linn.....	Duck-weed.
"	<i>Wolffia arrhiza</i> Wimm. ...	
97. Eriocaulæ (The Pipewort Order.)	<i>Eriocaulon setaceum</i> , Linn	Gondali.
98. Cyperaceæ (The Sedge Order.)	<i>Fimbristylis æstivalis</i> , Vahl.	
"	<i>Carex indica</i> , Linn.....	Indian Rush. Lavicha gavat.
"	<i>Cyperus umbellatus</i> , Burm.	
99. Gramineæ (Grasses.)	<i>Paspalum scrobiculatum</i> , Linn.	Kodra. Cultivated.
"	" <i>costatum</i> , Hockst.	
"	<i>Isachne elegans</i> , Dalz. & Gibs.	Dunda.
"	" <i>Lisboæ</i> , Hook. f.	
"	<i>Panicum prostratum</i> , Lamb.	Sarpap.
"	" <i>erucæforme</i> , Sibth.	Shimpi, Wag-hakt; i.e. "Tiger's claws."
"	" <i>colonum</i> , Linn...	Rovar, Sarvank, Hurund.
"	<i>Tricholena Wightii</i> , Nees.	Rard, Giri.
"	<i>Setaria glauca</i> , Beau	Berdi, Bádra. The small variety with yellow awn-like hairs is called Kolara, (Lisboa).
"	" <i>italica</i> , R. Br. ...	Kangoni, Kora-kangoni.
"	<i>Pennisetum typhoideum</i> , Rich.	Bájri. Cultivated.
"	<i>Coix Lachryma</i> , Linn.....	Kasai, Ran-maka. Job's tears.
"	<i>Polytoca Cookii</i> , Stapf.	On the FitzGerald Ghât (Lisboa.)
"	<i>Zea mays</i> , Linn	Buta, Maka. Cultivated. "Indian corn."
"	<i>Oryza sativa</i> , Linn	Cháwal, Tándul. Rice. Cultivated.
"	<i>Arundinella stricta</i> , Nees.	Kotir.
"	" <i>tenella</i> , N.	

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
99. Gramineæ (Grasses.)	<i>Arundinella spicata</i> , Dalz.	Barel.
—Contd.		
"	" <i>avenacea</i> , Munro.	
"	<i>Dimeria ornithopoda</i> , var. <i>tenera</i> .	
"	<i>Saccharum officinarum</i> , Linn.	Serdi, Uss. Sugarcane. The cut-up pieces are called Gauderi.
"	<i>Arthraxon lanceolatus</i> , Hochst.	
"	" <i>echinatus</i> , Hochst.	Faradiache-gás.
"	" <i>molle</i> , Nees.	
"	<i>Ophiurus corymbosus</i> , Gaert. f.	Karod, Karvel.
"	<i>Rottboelia divergens</i> , Hack.	
"	<i>Manisuris granularis</i> , Linn. f.	Kangoni.
"	<i>Ischæmum conjugatum</i> , Roxb.	Bher.
"	" <i>pilosum</i> , Wight.	Kunda, Pharan.
"	" <i>laxum</i> , R. Br...	Sukál.
"	<i>Heteropogon contortus</i> , Roem and Schutt.	Kusal, Pandhri-Sukál, Bál. Spear grass.
"	<i>Andropogon polystachius</i> , Roxb.	
"	" <i>muricatus</i> , Roth.	Valerum, Valla. The root is the well known sweet-scented " Khaskhas" grass.
"	" <i>Schoenanthus</i> , Linn.	Rusha, Rosha. Lemon Grass, Ginger Grass. Common at Mahables- war and Lanowli. A large grass with scented roots from which an oil (Rosha) is extracted for export to the Medi- terranean ports. It is used for adulterating Otto of Roses in Turkey (Lisboa).
"	<i>Anthistiriacimbaria</i> , Roxb.	
"	" <i>ciliata</i> , Linn. f.	Batáni.
"	<i>Apluda aristata</i> , Linn. ...	Tulsi, Bungrat.
"	<i>Avena sativa</i> , Linn. ...	Jao. Oat. Cultivated.
"	<i>Cynodon dactylon</i> , Pers...	Harala, Hariyali, Durb, Durba.
"	<i>Chloris barbata</i> , Severt. ...	Goshya.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
99. Gramineæ (Grassæ) —Contd.	<i>Tripogon capillatus</i> , <i>Jaub.</i> and <i>Spach.</i>	At Matheran on trees. "Inter muscos, <i>supra</i> <i>arbores et saxa.</i> " (<i>Jac-</i> <i>quemont</i>).
"	<i>Tripogon Lisboaë</i> , <i>Stapp.</i> ...	
"	<i>Eleusine corocana</i> , <i>Gaert.</i>	Náchni, Nágli, Rági. Ex- tensively cultivated.
"	<i>Eragrostis ciliaris</i> , <i>Link.</i> ...	Undir-puncho, i.e. "Rat's foot."
"	" <i>unioloides</i> , <i>Nees.</i>	Poi, Poki.
"	<i>Triticum vulgare</i> , <i>Linn.</i> ...	Gehun. Wheat. The wheat cultivated on the high table-land of the Deccan and in Maha- bleshwar is said to have, in a given bulk, about $\frac{1}{5}$ more weight than that raised in the plains. Be- low the ghâts, the climate does not suit it (Lisboa).
"	<i>Bambusa arundinacea</i> , <i>Rorb.</i>	Váns.
"	" <i>vulgaris</i> , <i>Wendl.</i>	Kuluk, Bambu.
"	" <i>arundo</i> , <i>Nees</i> ...	Chivari.
"	<i>Oxyanthera</i> <i>Stocks.</i> <i>Munro.</i>	
"	<i>Dendrocalamus strictus</i> , <i>Nees.</i>	

DIVISION B.—CRYPTOGAMIA or FLOWERLESS PLANTS.

CLASS I—VASCULAR CRYPTOGAMS.*

100. Lycopodiaceæ (Club mosses.)	..... <i>Lycopodium imbricatum</i> .	Kala tura, In damp shady places.
"	" <i>obtusatum</i> , <i>Fair-</i> <i>bank.</i>	Mahableshtar.

* The Cryptogamia differ from the Phanerogamia in having no flowers containing anthers and ovules. The vascular Cryptogams "possess true vessels, and are also characterized by the development from the spore of a leafless prothallium of small size, bearing the oospheres from which, after fertilisation, the spore-bearing plant is produced." Thome and Bennett "Text Book of Structural and Physiological Botany," p. 240.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.,
101. Filices (Ferns). Sub-order — Polypodiaceæ		
"	<i>Leucostegia immersa</i> , Wall.	On trees and banks at Bombay Point (Fairbank).
"	" <i>pulchra</i> , Don.	On trees.
"	<i>Schizoloma ensifolia</i> , Swartz.	
"	<i>Adiantum lunulatum</i> , Burm.	Hansraj, Rajhans, i. e., "Goose-foot" fern, Maidenhair fern.
"	" <i>capillus veneris</i> , Hook.	On wet rocks, near Panchgani (Cooke).
"	<i>Cheilanthes farinosa</i> , Kaulf.	Patkuri. Silver fern. Common everywhere on the two Hills. The "Copper-fern" variety is found at Pertabgarh (Fairbank).
"	<i>Pteris longifolia</i> , Linn. ...	In the Konkan, below Mahableshwar (Fairbank).
"	" <i>pellucida</i> , Presl. ...	
"	" <i>quadriaurita</i> , Retz. ...	
"	" <i>aquilina</i> , Linn. ...	Netsa. Brake fern.
"	<i>Campteria biaurita</i> , Linn.	
"	<i>Blechnum orientale</i> , Linn.	At Kās (Fairbank).
"	<i>Asplenium lunulatum</i> , var. <i>trapeziforme</i> , Roxb.	
"	" <i>falcatum</i> , Lam.	
"	" <i>laciniatum</i> , Wall. ...	
"	<i>Athyrium filix-foemina</i> , var. <i>flabellulata</i> , Clarke.	Lady fern.
"	" <i>gymnogrammoides</i> , Kl.	
"	<i>Anisogonium esculentum</i> , Presl.	Common on the Yenna, Mahableshwar.

* Ferns have usually a simple or branched creeping rhizome; less often an erect simple, woody stem, as in the tree-ferns. The rhizome or stem dies off slowly at its lower end or becomes lignified. (— and Bennett, p 308.)

The ferns in this list are arranged in the order given in Col. Beddome's Hand-book of the Ferns of British India.

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
101. Filices (Ferns). Sub-order— Polypodiaceæ—Contd.	<i>Actiniopteris dichotoma</i> , <i>Forsk.</i>	Palm fern, Khandala Ghât on Mahableshwar road, and on the Kartraj Ghât near Poona.
"	<i>Aspidium polymorphum</i> , <i>Wall.</i>	In a thicket on the south side of the stream, half-way between the lake and Lingmala, Mahableshwar (Fairbank).
"	" <i>cicutarium</i> , <i>Sw.</i>	Kājāryache Bashing. Indian Beech-fern.
"	<i>Lastrea Filix-mas</i> , <i>var.</i> <i>elongata</i> , <i>Hook. & Grev.</i>	Male-fern.
"	<i>ib. var. cochleata</i> , <i>Don.</i>	
"	" <i>odontoloma</i> , <i>Moore.</i>	At Kate's Point, and along the crest of the hill on the way to Panchgani, where it grows on walls (Fairbank).
"	" <i>sparsa</i> , <i>Don.</i>	On the Yenna, near the falls (Fairbank).
"	<i>Nephrodium molle</i> , <i>Desv.</i>	
"	<i>Nephrolepis cordifolia</i> , <i>Linn.</i>	On trees.
"	<i>Drynaria quercifolia</i> , <i>Linn.</i>	Kadik-pān, Indian Oak-fern.
"	<i>Pleopeltis linearis</i> , <i>Thunb.</i>	
"	" <i>membranacea</i> , <i>Don.</i>	
"	<i>Polybotrya appendiculata</i> , <i>Willd.</i>	Only one specimen of this fern is known to have been found at Mathe- ran. It was for many years in my garden at "Underwood." I have seen it covering quite an acre of ground on the Ghât at Ghotne, East of Ratnagiri.
"	<i>Gymnopteris variabilis</i> , <i>var. lanceolata</i> , <i>Hook.</i> <i>Herb Co.</i>	

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
101. Filices (Ferns). Sub-order— Polypodiaceæ ..Contd.	<i>Gymnopteris suberenata</i> , <i>Hook & Gres.</i>	Rooting fern. Once plentiful on favourite sites at Matheran. Now almost exterminated by fern-hunters.
Sub-order— Osmundaceæ. "	<i>Osmunda regalis</i> , <i>Lin.</i> ...	Nadicha Múrúd. The Royal Fern. Below the lake, Mahableshwar, and at Lingmala and elsewhere. Still fairly plentiful.
Sub-order— Schizæaceæ. "	<i>Lygodium flexuosum</i> , <i>Sw.</i>	Hansraj-yel. Creeping fern.

CLASS II.—CELLULAR CRYPTOGRAMS.

SUB-CLASS 1.—MUSCINEÆ.* (Mosses and Liverworts.)

102. Musci (Mosses). ...	<i>Octoblepharum albidum</i> , <i>Hedw.</i>
"	<i>Tortula Bombayensis</i> , <i>Mitten.</i>
"	" <i>cylindrotheca</i> , <i>Mitten.</i>
"	<i>Macromatium sulcutum</i> , <i>Brid.</i>
"	<i>Meteorium scrabiusculum</i> , <i>Mitten.</i>
"	<i>Stereodon angustus</i> , <i>Mitten.</i>
"	<i>Hypnum squarrosum</i> , <i>F.</i> <i>E. Tripp.</i>
"	" <i>bryoides</i>
"	" <i>reflexum</i> , <i>F. E.</i> <i>Tripp.</i>

* In the mosses and the higher liverworts "we have, for the first time, a differentiation of the vegetative structure into distinct stem and leaves." (Thomé and Bennett, p. 240). The Mosses are generally of a higher type than the Hepaticæ or liverworts, "no longer possessing any of the characteristic features of Thallogens, but having a cylindrical stem covered with..." (p. 301).

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
SUB-CLASS 2....THALLOPHYTE,* (Leafless cellular cryptogams.)		
103. Fungi.		
Sub-order—		
Carpomycetes		
(Mushrooms).	Hypoxylon atropurpureum, Fr.	
"	" serpens, Fr...	
"	Xylaria polymorpha, Fr..	
"	Hirneola auricula-Judæ Fr.	
"	Tremella mesentrica, Retz.	
"	Calocera viscosa, Fr.	
"	Corticium læve, Britz. ...	
"	" violaceum, Kirtikar.	
"	Clavaria inequalis, Berk..	
"	" fusiformis, Sow.	
"	" cinerea, Bull. ...	
"	" alba, Kirtikar ...	
"	Thelephora palmata, Fr.	
"	" terrestris, Berk.	
"	Hydnum aureum, Fr. ...	
"	Boletus luridus, Schaeffer.	
"	Polyporus spongia, Britz.	
"	" hirsutus, Britz.	
"	" annuosus, Britz.	
"	" perennis, Fr...	
"	" crassipes, Currey.	
"	" cinnabarinus, Fr.	
"	Dædalia gibbosa, Eng. ...	
"	" ferruginea, Schum.	
"	Trametes umbrinus, Currey.	
"	Hexagonia Kurzi, Currey.	

* Thallophytes are plants which have no leaves and no vascular tissue, but are constructed of cells only. (Thomé and Bennett, p. 239.) The Zygomycetes are "common mould-fungi, growing on living plants, decaying vegetable substances, or the fine surface of organic solutions." (Ib., p. 271.) The Myxomycetes or Slime Fungi "are distinguished from all other plants by the fact of their cells being without a cell-wall during the whole of their vegetative period. It is only when their protoplasm comes to rest, or their growth has ceased on the formation of the fructification, that the protoplasm breaks up into small cells provided with a cell-wall, but not forming a true tissue. They live on decaying and putrefying vegetable substances." (Ib., p. 269.)

Natural Order.	Genus and Species.	Vernacular or English name, use, habitat, &c.
103. Fungi— <i>Contd</i>	<i>Lepiota procerus</i> , <i>Scop</i> ...	} Alamben, Mushroom.
"	" <i>cristata</i> , <i>A. & S.</i> ...	
"	<i>Armillaria ramentacea</i> , <i>Bull.</i>	
"	<i>Pleurotus ostreatus</i> , <i>Jacq.</i>	
"	<i>Cortinarius genitilis</i> , <i>Fr.</i>	
"	<i>Galera tenera</i> , <i>Schaeff</i> ...	
"	<i>Bolbitius apicaulis</i> , <i>W. G.</i> <i>Smith.</i>	
"	<i>Agaricus campestris</i> , <i>Linn.</i>	
"	<i>Psilocybe udus</i> , <i>Pers</i> ...	
"	<i>Panaeolus retirugis</i> , <i>Batsch</i>	
"	<i>Psathyrella arata</i> , <i>Berk</i> ...	
"	<i>Coprinus comatus</i> , <i>Fr.</i> ...	
"	" <i>atramentarius</i> , <i>Fr.</i> ...	
"	" <i>platypus</i> , <i>Berk</i> ...	
"	" <i>congregatus</i> , <i>Berk</i> ...	
"	<i>Schizophyllum commune</i> , <i>Fr.</i>	
"	<i>Lentinus tigrinus</i> , <i>Fr.</i> ...	
"	" <i>caespitosus</i> , <i>Currey</i> .	
"	<i>Lycoperdon saccatum</i> , <i>Vahl.</i>	} Bhuiphod, Puff Ball.
"	<i>Cyathus striatus</i> , <i>Berk</i> ...	
<i>Sub-order—</i>		
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SUPPLEMENTARY NOTE ON THE FLORA OF MATHERAN AND MAHABLESHWAR.

BY THEODORE COOKE, LL.D., F.G.S., C.I.E.

AN observant visitor to Matheran cannot fail to be struck with the way in which certain plants disappear as he ascends the hill from Narel. The Teak tree (*Tectona grandis*), the skeleton of whose dried leaves is so like lace-work, disappears before half the ascent is accomplished. The *Sterculia urens*, which looks as if its bark had been stripped off, and which is a very conspicuous tree along the ascent, also disappears, as well as the *Phyllanthus Emblica*, whose gooseberry-like fruit is used by the natives for pickling. On Matheran hill itself, many plants are met with which are not found on the plains below; and as we ascend to a still higher elevation and reach the table-land of Mahableshwar, 2,000 feet above that of Matheran, we find the effect of increased elevation in the gradual thinning out of certain plants, and the appearance of new ones. This is particularly noticeable on the ascent from the Koyna Valley,—which is about 1,500 feet below the table-land of Mahableshwar,—as the paths, by several of which the ascent may be accomplished, pass along well-wooded slopes.

Ascending from the Koyna, the valuable Ain tree (*Terminalia tomentosa*) is very soon lost to view, and the only representative of the family (COMBRETACEÆ) on the hill summit is the *Terminalia Chebula*, which supplies the Myrabolans so largely exported for the tannin they contain.

In the same way the *Grewia Microcos* and the *Wrightia tinctoria* disappear, the former very soon, while the latter is carried up very near to the plateau on the Ghât Road, near the small village of Mettala. The *Casearia graveolens* may be found still higher up, but does not reach the summit, though it grows luxuriantly along the Ghât Road, not very far below Bombay Point, while the *Albizzia stipulata*, which is such a conspicuous tree at Matheran, with its dark, reddish-brown, papery pods, and its large, pinkish, brush-like flowers, ceases abruptly on the FitzGerald Ghât Road, about 4 miles from Mahableshwar.

Looking through the list, so carefully and laboriously prepared by Mr. Justice Birdwood, I would make the following remarks :—

The *Reinwardtia trigyna*, which, in the introductory note to the Catalogue, is said to have been found truly wild on Varandha Ghât, I have found wild in the Koyna Valley; at least I have found it growing luxuriantly in a dense jungle near the Koyna, in a locality far removed from any human habitations. The *Brugmansia candida* is not indigenous. It is, I believe, a native of Peru, but it has found the climate and soil of Mahableshwar well suited to its development, as it grows most luxuriantly over the hill, and has been planted along the FitzGerald Ghât Road. Its large, white, funnel-like flowers render it a very conspicuous object.

The *Clematis Wightiana* is not, as far as I know, found at Matheran, nor does it extend much below the summit of Mahableshwar. Its flowers are large and yellow, but as it flowers in January and February, when the hill is not much frequented, its blossoms are rarely seen. The plants in Orders 2 and 3 do not occur at Mahableshwar. The *Cocculus macrocarpus* does not quite reach the hill summit, though it may be found just below the Dhobi's Fall. *Polygala persicariæfolia* does not, I think, occur at Matheran, and, indeed, is rare at Mahableshwar. It may be met with on the path leading from Lingmala Ravine towards the Waterfall. *Ancistrocladus Heyneanus*, though tolerably common at Matheran, does not reach Mahableshwar; nor do the plants of the Order GUTTIFERÆ, immediately preceding. Of the MALVACEÆ, neither *Hibiscus hirtus*, *Thespesia Lampas*, nor the *Bombax*, and of the STERCULIACEÆ, none of the plants catalogued are to be found at Mahableshwar. The *Triumfetta rhomboidea* is tolerably common, the *Eleoarpus oblongus* rare.* There is a good tree of the latter in Lingmala garden, and a couple on the bank of the stream below the house. There is also a solitary tree in the compound of Prospect Cottage, at the corner of the Cross Road, just opposite the entrance gate of Temple Hall. Many of the leaves of this tree turn red, which render it a conspicuous

* "*Eleoarpus oblongus* grows in luxuriant abundance all along the stream above Lingmala Falls. It is in full flower at the end of May" (C. Macnaghten). It is also fairly abundant in the woods at Lingmala. I have noticed it also on the Panchgani road, about two miles from Mahableshwar.—H. B.

object among the foliage of the woods, and the fringed petals of its flowers are very beautiful, the brownish-red calyx appearing through the interspaces between the petals. All the plants catalogued under the genus *Impatiens* are to be found at Mahableshwar, among them a very remarkable one, a yellow balsam (*I. Dalzellii*). *Evodia** *Roxburghiana* does not occur at Matheran, and is somewhat rare at Mahableshwar. One tree (a male) may be found on the Panchgani Road, a few yards beyond the turn to Kate's Point. There is another tree at the fourth culvert on the FitzGerald Ghât Road, and a little further down the road, close to a culvert, are two trees, a male and female. A knowledge of some localities where a tolerably rare plant may be found will be useful to collectors. Neither of the Orders BURSERACEÆ and MELIACEÆ are represented on Mahableshwar.

The *Mappia foetida* is a very remarkable as well as common tree at Mahableshwar. I do not think it occurs at Matheran. The odour of its yellowish flowers, which appear in October, is most offensive, savouring of carrion. Visitors to the hill are often puzzled by the strange odour, and unable to account for it. There is a tree in the Superintendent's compound, at the side nearest the Club, and several trees may be found close to the road, just below the Bund. *Zizyphus rugosa* is common both at Matheran and Mahableshwar, and its white berries are edible, though not very palatable. *Zizyphus xylopyrus* does not occur at Mahableshwar, while the *Scutia indica* is only found on the higher Ghâts and does not descend to the level of Matheran. It is known at Mahableshwar as the "Wait-a-bit thorn," as when its hooked-thorns catch the clothes of a rambler through the woods, there is no going forward till the thorns are unhooked,—often a difficult process. It may be easily identified by its native name "Chimat."

Hemigyrosa canescens does not ascend to Mahableshwar, nor does *Schleichera trijuga*, but the Order (SAPINDACEÆ) is abundantly represented by the shrub *Allophylus Cobbe*, which, with its soft, trifoliate leaves and long racemes of small, white flowers, is scattered every-

* "I have seen many trees of *Evodia Roxburghiana* at Mahableshwar, some in flower, just opposite Bella Vista, and a great many in the woods between the Dhobi's Waterfall and Glengarry" (C. Macnaghten). There are a good many trees of *Evodia* on the FitzGerald Ghât, near the Terraces. The *Toddalia aculeata*, which belongs to the same Order, is much rarer.—H. B.

where over the hill-top. The LEGUMINOSÆ are largely represented on both hills, but it is a remarkable fact that, while in Matheran there are several *trees* belonging to the Order, there is not a single tree on Mahableshwar belonging to it.* The *Crotolaria*, *Smithia*, *Desmodium*, *Phaseolus*, *Vigna*, *Atylosia*, *Cylistis* and *Flemingia* are common to both hills; but the only *Acacia* on the summit of Mahableshwar is *Acacia Intsia*.

Of the ROSACEÆ, the *Rubus lasiocarpus* or Mahableshwar Raspberry is very common and well-known. This plant is indigenous here and on the highest Ghâts to the Southward. *Rubus moluccanus* has been found at Mahableshwar, but it is very rare. It may be found in a ravine on the road to old Mahableshwar. I found it very abundantly on the highland (Newera Elliya) in Ceylon.

Of the RUBIACEÆ, neither *Adina* nor *Stephegyne* occurs at Mahableshwar, the *Wendlandia Notoniana* does not occur at Matheran; and I have only seen it in Mahableshwar near the banks of the stream (Yenna) below Lingmala. *Psychotria truncata* is a rare plant, occurring, as far as I know, at Mahableshwar, in a single locality, which being far removed from habitations and in a dense jungle, it is difficult to describe.† *Mussaenda frondosa* does not ascend to Mahableshwar, though common at Matheran and in the Koyna Valley, where its velvety, orange flowers and curious, white, leaf-like bracts may be seen throughout the woods. Most of the COMPOSITÆ are common to both hills, but *Elephantopus scaber* does not ascend to Mahableshwar, though plentiful at Matheran and in the Koyna Valley, and the same may be said of *Cyathocline lyrata*, while I do not know that *Adenostemma viscosum* or *Adenoon indicum* have been found at Matheran, though common at the higher elevation. The commonest of the Composites at Mahableshwar, scattered all over the hill with the brake-fern, is *Conyza stricta*.

* Hooker, in speaking of Pachén (7,000 ft. high) near Darjeeling, says:—"The absence of *Leguminosæ* was most remarkable, and the most prominent botanical feature in the vegetation of this region. It is too high for the tropical tribes of the warmer elevations, too low for the Alpines, and probably too moist for those of temperate regions; cool, equable, humid climates being generally unfavourable to that order." (*Himalayan Journals*, Vol. I, p. 112.)

† "Found several plants of it (May, 1890) growing on either side of the path from Falkland Point to the Chinaman's Waterfall, not very far from the gorge of the waterfall" (C. Macnaghten).

Of the CAMPANULACEÆ, the little *Wahlenbergia gracilis* does not grow at a low elevation. It is not found at Matheran and is very rare at Mahableshwar, the elevation being apparently insufficient, for at the high elevation of Newera Elliya, Ceylon, it grows very abundantly.

The *Sideroxylon tomentosum*, which is very abundant at Matheran, does not seem to thrive at Mahableshwar. It is nowhere found near the central portion of the hill-top, and is confined to its edges. It is to be met with on the path-way up to Lodwick Point, and also occurs near Bombay Point. Neither *Bassia latifolia* nor *Mimusops Elengi* occurs at Mahableshwar, while the Order EBENACEÆ does not possess a single representative.

Symplocos Beddomei is not met with at Matheran, but is tolerably plentiful at Mahableshwar. It flowers in the cold season; its blossoms have the odour of the hawthorn, and its berries, which ripen in May, are blue. There are one or two trees just opposite the gate of the Cemetery. The *Jasminum arborescens* is common to both hills, and its fragrant white flowers are seen in great profusion in April. The *Olea dioica*, which is very common at Matheran, is rarely met with in the Mahableshwar woods, while the *Ligustrum neilgherrense* is very common on the latter hill, and does not occur at all on the former. Its fragrant white flowers appear abundantly in October. Of the APOCYNACEÆ there is but one representative on the Mahableshwar hill, and that is a rare plant, the *Rauwolfia densiflora*. It may be found in the ravine below the Forest Officer's bungalow at Lingmala. Its white flowers appear in April. Of the ASCLEPIADS, the *Calotropis gigantea* does not ascend to the elevation of Mahableshwar. The most remarkable plant of the Order which occurs there is the *Gymnema sylvestre*, which is an extensive climber, with small yellow flowers, appearing in the hot weather. The leaves of this plant, when chewed, possess the strange property of destroying for a time the taste for sugar, while exercising no effect on the taste for substances other than saccharine. If two or three leaves be chewed and the tongue and palate moistened with the juice, the result of taking a little sugar in the mouth is very curious. It appears just like so much sand, while salt or anything not saccharine tastes just as usual.

Of the LOGANIACEÆ, the *Buddleia asiatica* is the only plant of the Order at Mahableshwar. It is very rare. There is one plant at Lingmala, near the out-houses of the bungalow, and I have seen a plant on the FitzGerald Ghât. Of the GENTIANs, the little purple *Exacum Lawii* is all over the Mahableshwar hill, in October, amongst the grass, but dies very soon after the rains cease. The *Swertia decussata* is found at Mahableshwar occasionally, but is not common there. It is very abundant on the hill-top above the Panchgani travellers' bungalow. An infusion of this plant is used by the natives as a febrifuge.

The Order BORAGINEÆ is represented on both hills by the genus *Paracaryum*.

The *Paracaryum coelestinum* is known as the Mahableshwar "Forget-me-not." It is very abundant both here and at Matheran. Two other *Paracaryums* are tolerably common at Mahableshwar, but as far as I know, do not occur at Matheran. The *P. malabaricum* is the more common, and may be found in large quantities at the Bund. *P. Lambertianum** may be found on the cliff, opposite the Dhobi's Water-fall, below General Barr's bungalow. Of the SOLANACEÆ, the *Solanum giganteum* is very abundant at Mahableshwar, but does not, as far as I recollect, occur at Matheran. It is to be found everywhere on the former hill, and its bunches of red berries are handsome.

The *Heterophragma Roxburghii*, which is very common at Matheran, does not seem to thrive at Mahableshwar. I only know of two trees at the latter place, and these are poor stunted specimens. One of them is just over the Yenna Waterfall, and the other a few yards beyond the thirtieth mile on the Satara Road.

Of the ACANTHACEÆ, *Thunbergia fragrans* may be found all along the Panchgani Ghât, and on the road from Panchgani to Mahableshwar, but, strange to say, it ceases at the sixty-eighth mile, half way between these stations. It is somewhat remarkable that it does not extend to Mahableshwar itself, as it is very abundant at the high elevation of Newera Elliya, Ceylon. The term *fragrans* is a misnomer, as its flowers are destitute of fragrance.

Of the BARLERIAS, *B. Prionitis*, with yellow flowers, is very common on the road up to Matheran, but does not occur anywhere near Mahableshwar. *Barleria strigosa*, with large blue flowers, is common

* I have also found it, with Dr. Cooke, on the FitzGerald Ghât.—H. B.

at Matheran, where it may be found in abundance below Ponsonby's Spring, but is only to be found on the slopes of Mahableshwar and not on the hill-top. It may be seen in flower in the cold season, on the slope some way down below the Dhobi's Glen. *Ebolium Linneanum*, which is very common at Matheran, and has green flowers, is not found at Mahableshwar; nor is the magnificent *Calacanthus Dalzelliana* which grows in profusion on the wet rocks on the road up to Matheran, about a mile below the *Chauki*. Of the VERBENACEÆ, the *Callicarpa lanata* is common to both hills, the *Tecoma grandis* does not reach even half-way the ascent to Matheran, and the *Premna coriacea* and *Gmelina arborea* do not grow at Mahableshwar. *Vitex Negundo* will no doubt flourish on either hill; it has been largely planted along the FitzGerald Ghât, and *Vitex leucoxydon* is to be found in the Koyna Valley. The *Clerodendron serratum* is not found on Matheran, nor on the Mahableshwar hill-top, but it may be found about Lingmala Ravine and on the Panchgani Road; it also occurs on the slope below Bombay Point on the road to the Koyna. The most common of the LABIATÆ, both at Matheran and Mahableshwar, is *Leucas stelligera*. At Mahableshwar, another member of the genus occurs, *Leucas ciliata*, a larger and much less common plant than *L. stelligera*. *Dysophylla myosuroides* is not found at Matheran, but is common in the Mahableshwar water-courses. It is abundant in the *nulla* near the Sassoon Point Tennis Court, just below where the road from the bazaar crosses the stream. *Micromeria capitellata* (*M. Malcolmii* of Benthham) is a small plant peculiar to Mahableshwar. It is found along the Yenna, below the Bund, and has a strong odour of peppermint.

The *Plantago major* is rare at Mahableshwar, and is not found at Matheran. It may be found on the banks of the Yenna River.

The *Lasiosiphon eriocephalus* is common to both hills, and is particularly abundant at Mahableshwar. The handsome climbing shrub *Elæagnus latifolia*, the undersides of whose leaves have a sheen like silver, and whose pink-coloured fruit is edible, is also common to both hills. Of the LORANTHUS family, I have not found either *L. involucratu*s nor *L. lageniferu*s at Mahableshwar. The *Osyris arborea* is not found at Matheran, although growing at Khandalla, which is close by. It can be readily identified by its native name, "Lotal." The Order EUPHORBIACEÆ is better represented at Matheran

than at Mahableshwar. The Crotons are entirely absent from Mahableshwar. *Flüggea Leucopyrus* ascends about half-way up the hill from the Koyna and then ceases; while of the three trees *Glochidion lanceolarium*, *Bridelia retusa* and *Macaranga Roxburghii*, the first only occurs in any quantity in Mahableshwar. Though the *Bridelia* does occur in one place, the top of the old Rotunda Ghât below Bombay Point, it does not, as far as I know, occur anywhere else,* and should, therefore, be hardly considered a Mahableshwar tree. The *Macaranga* does not grow at Mahableshwar at all, but the Bhoma (*Glochidion lanceolarium*) is very abundant. *Homonoia riparia* is to be found in beds of streams at Mahableshwar, not at Matheran, and may be collected in the bed of the ravine below the Dhobi's Waterfall. Of the URTICACEÆ, *Girardinia heterophylla*, a formidable stinging nettle, is common to both hills, as are also the *Boehmeria platyphylla*, var. *scabrella*, and the *Trema Wightii* (*T. orientalis*, Blume). *Fleurya interrupta* is not found at Mahableshwar, nor is *Debregeasia velutina*, a native of Matheran. *Ficus glomerata* (Umbar) is common on both hills, but none other of the genus *Ficus* is to be found on the hill-top of Mahableshwar, except *Ficus palmata*, although *F. asperima*, *F. Rumphii* and *F. infectoria* may be met on the slopes. The *Artocarpus integrifolia* does not reach Mahableshwar; it is cultivated near villages in the Koyna Valley, and there is one tree at the village of Mettala on the plateau below Bombay Point.

The *Salix tetrasperma* or Indian Willow does not grow at Matheran; it is abundant along the Yenna River, and may be seen in flower in October.

With regard to the ORCHIDACEÆ, the handsomest one at Mahableshwar is the *Ærides crispum* which does not occur at Matheran,† and the most showy one at Matheran is *Ærides maculosum*, which is not found at Mahableshwar, though it is seen on the Panchgani Road.

The *Dendrobium barbatulum* is common to both hills, and is in flower in March and April. *Dendrobium ramosissimum* is not found on the summit of either hill. It is very abundant in the Koyna Valley.

* "I saw a large tree on the right of the path leading to Lodwick Point in flower and fruit, in April, 1890, and another tree to the right of the path about 20 feet beyond Lodwick Monument" (C. Macnaghten).

† I found a specimen of *Ærides crispum* in my own compound at Matheran many years ago; and specimens have been brought to me from the valleys below.—H. B.

Dendrobium Macraei, a curious looking orchid with many large pseudo-bulbs, and a single leaf growing out of the terminal one, is very rare at Mahableshwar, and is not to be found at Matheran. It is very abundant in the Koyna Valley, some of the old trees along the river being literally covered with this, *Dendrobium ramosissimum*, and the bulbs of the *Cirrhopetalum fimbriatum*. A visit to the Koyna Valley will amply repay a plant-hunter. The ferns and orchids in some parts near the river are in the greatest profusion, and must be seen to be appreciated.

Of the two hills, Matheran and Mahableshwar, the former has the more varied flora, but several plants are found in Mahableshwar which do not exist at the lower elevation of Matheran. I have made a rough estimate, which is not correct to a dozen plants or so, that there are about 140 plants (excluding grasses) which occur at Matheran, and which do not occur at Mahableshwar, and that there are about 130 plants which are found at Mahableshwar, and not on Matheran, while there are perhaps 140 common to both hills.

T. COOKE, LL.D., F.G.S.

In now reproducing the above Note, I have in some places altered the scientific names used by Dr. Cooke, as I have thought it better to follow the nomenclature of Hooker's Flora of British India, as in the Catalogue.

On the Flora of Partabgarh, which is really a part of the Mahableshwar system, the late Mr. Chester Macnaghten sent me some years ago the following note :—

“On Partabgarh I made a general note that its flora resembled that of Matheran ; for we find on that historical hill, in addition to the Mahableshwar trees, a great abundance of the others so characteristic of Matheran—*Grewia Microcos*, *Lagerstœmia parviflora*, *Woodfordia floribunda*, *Casearia graveolens*, *Albizzia stipulata*, *Leea staphylea*, (*L. sambucina* in the Catalogue), *Cocculus macrocarpus*, *Careya arborea* and *Heterophragma Roxburghii*.”—H. B.

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Photographed by N. C. Macleod.

Marten Bros. Photo. Imp. London.

THE INDIAN WILD DOG.
Cyon dukhunensis.

THE INDIAN WILD DOG.

(Cyon dukhunensis.)

By J. D. INVERARITY.

*(With a Plate.)**(Read before The Bombay Natural History Society, on 17th April, 1896.)*

The wild dog is the type of a separate genus, and differs in some remarkable respects from the *Canidæ*.

In its dentation it differs, as it wants the second tubercular behind the flesh tooth in the lower jaw.

The number of mammæ are also in excess of those of the members of the dog tribe.

The wild dog, though common enough, is not very often seen, and any individual sportsman's experience of the animal is limited. Mr. Littledale has collected together from various sources information about the wild dog in a paper published in this Society's Journal, Vol. VII, page 494, and there is also an interesting reprint of a paper on the same subject in Vol. VII, page 127.

I will therefore not go over the same ground again, but confine this paper to some personal experiences of my own. The photograph is that of a female shot by Mr. N. C. Macleod on 3rd June, 1895. She measured in length 4 feet 4 inches from nose to the tip of the tail, of which the tail measured 17 inches, her height at the shoulder was 19½ inches. She had 14 mammæ, 8 on the left side and 6 on the right.

I first saw her early on the morning of 29th May, 1895, when I was engaged investigating the bed of a nullah for the tracks of any tiger that might have passed that way. Something moving attracted my eye, and I saw the dog walking along in the jungle close to the nullah not more than 20 yards off. A few yards behind her was a half-grown young one. They did not see me. I had left my rifle at a tree where I had spent the night over a "gara," and on my trying to creep back to the spot in order that I might be in a position to murder them, they saw me and bolted away across the nullah, the young one in its haste jumping into the water which the old one leapt over.

On the 1st June, 1895, Macleod and myself were walking up a nullah, looking for tiger at 4 p.m., 6 miles distant from the spot where I first saw them, when the old dog and her young one were seen by us drinking at a pool. On seeing us they retreated into the jungle and afterwards crossed the nullah at a slow pace. At dawn of June 3rd, Macleod who had been

sitting in a tree all night over a hill, heard a splash in the water close by, and there were the two dogs again sitting in the water. This place was about half-way between the two places where they had been previously seen, for I have no doubt that they were the same dogs. He then shot the old one, the young one kept moving through the jungle, a short distance at a time calling for its mother, and though pursued for some way eventually escaped. On opening the stomach of the dog it was full of the flesh and skin of a four-horned antelope, quite fresh, in fact it could only just have been eaten. This seems to prove that the wild dog preys by night as well as by day. That we came across these dogs on three occasions in five days is remarkable. Near my previous camp, some 12 miles off, there were two or three lots of wild dogs. I had shot a tigress in a nullah and had her tied up again in the same place. The men who went to look at the gara on the morning of May 24th, reported that it had been killed by dogs, and that they had seen five dogs on it. I sent some men armed with a shot-gun to sit over the carcass and try to shoot them. As they got near the place they saw a dog and shot it. It was a male, not fully grown. He measured 3 feet 5 inches in length, of which the tail was 14 inches. In height 15½ inches. The brush of the wild dog is usually black throughout, but this specimen had a white tag to his tail. When the men returned they related an extraordinary yarn to the effect that, while sitting near the hill for the dogs to return to it, a herd of bison appeared. A policeman fired his musket at one from a tree and wounded it. He had only one bullet left and reloading he and his companions followed the track and soon came on the wounded bull at which he fired again. The bullet lodged in a tree; they cut it out, loaded again, and proceeded, when a bear popped up quite close. The policeman fired and they all bolted without waiting to see the result. Having had enough sport for the day they returned to camp. I was rather sceptical; but their story was a true one. Next morning Macleod and Turner of the Hyderabad Cavalry, went to the spot and tracked up the bison, a Small bull. They killed it. As his shoulder had been broken he had not gone very far. On their way back they found the bear, an old male, dead, the bullet having shattered the brain-pan.

The next morning when the men went to look at a gara they saw 8 dogs attacking it by jumping up at its throat and they frightened them

off. This was at the foot of some hills about a mile from the previous place. The gara had some bites in the throat from the effect of which it died, and on the same night another gara was also bitten by wild dogs at a different place. Whether these dogs all formed part of one pack and were separately hunting, or distinct packs I do not know.

I only remember one other instance of a gara being attacked by wild dogs. This was several years before. On going to the place I found the tuft of hair at the end of the buffalo's tail pulled out and lying on the ground with some drops of blood, but no sign of the buffalo. I never found it or any trace of it. The tracks of the dogs and of the buffalo were numerous at the spot, but could not be followed, as the ground was too hard. I could never make out what became of the animal.

On two occasions only have I seen wild dogs in pursuit of their game. I mentioned the circumstances in a paper on samber, Vol. VIII, page 394, as follows :—

“ The first time they pulled down a calf about 150 yards from where I was. I heard a squealing and the loud barks of the mother, who stood close to the scene of the tragedy. Thinking a tiger had killed, I stalked up to the noise, and when close to, saw a yellow mass that I took to be a tiger, and was just going to fire when to my astonishment it split up into a dozen pieces and disappeared. I found the calf with its entrails torn out and eaten, part of the rump was eaten, and the eyes picked out—all in a few seconds. I hid myself behind a tree and in about 20 minutes the pack of dogs returned, they passed me within 15 yards, in single file, a dozen in number, ten paces between each dog. I, with difficulty, refrained from firing. I was between them and the samber, and they made a circuit and came up to the carcass from the opposite direction. As the leading dog reached the body, I could not wait any more. I fired and missed it, but luckily got one with the second barrel as they bolted. It was a female, and had the exact smell of a domestic dog. The second time I was sitting on the banks of the Taptee, having breakfast, when a hind and a calf rush down the opposite bank into the stream, which here was shallow and running pretty strong. On reaching the middle she stood in the water with her calf under her body, and I saw two wild dogs, in pursuit, stop at the water's edge. They uttered loud wailing howls, but the old hind and the young one seemed quite comfortable, the little one with its tail up frisking about under and around its mother. In a short time the dogs went away, and in about ten minutes afterwards the hind and calf went back to the same side they had come from and walked slowly off. You would have thought they would not have gone back to the same side as

the dogs were. On the same day a couple of hours afterwards, two dogs, which I believe must have been the same ones, ran a bull nilghai into the river opposite my tent. I did not see it myself, but my butler informed me that they tore its stomach open just as it reached the river. The nilghai swam across and sank when half way over, the dogs not following into the water."

On both occasions the dogs ran mute, though on the latter they gave tongue after the samber had taken to the water. In "Game" by "Hawkeye" there is a good paper on the wild dog, and I agree with the opinion there expressed that the wild dog seizes its prey at the flank, rending the skin and causing the entrails to protrude. This is the most natural thing to do when seizing a large animal in full flight. In the paper already mentioned at Vol. X, page 127, it is stated that they seize their game by the eyes, if possible. The instance of the samber calf that was killed close to me shows that the eyes are eaten immediately, but I doubt whether they seize at that spot.

The following account of the extreme voracity of the wild dog as related by an Indian Munchausen I don't remember having seen in print. He said that 12 dogs pulled down a samber close to him which was speedily devoured, eleven of the dogs then turned on the twelfth and killed and ate him, ten then killed and ate the eleventh, and so on until only one dog remained, who had thus succeeded in getting into his inside his eleven companions and the samber. The sportsman then thought it time to fire, but just as he was about to do so, the dog burst and spoilt the shot.

LIST OF BIRDS COLLECTED DURING FIVE YEARS'
RESIDENCE IN THE HYLAKANDY DISTRICT, CACHAR

NUMBERED ACCORDING TO OATES' "BIRDS (FAUNA OF BRITISH INDIA)," AND WITH REFERENCES TO HUME'S "NESTS AND EGGS OF INDIAN BIRDS," 2ND EDITION, AND "STRAY FEATHERS."

PART I.

BY C. M. INGLIS.

(Read before the Bombay Natural History Society on 16th April, 1896.)

Order *Passeres*.

Family *Corvidæ*.

Sub-Family *Corvinæ*.

Genus *Corvus* (Linn., 1766).

No. 4. *CORVUS MACRORHYNCHUS*.—The Jungle Crow (Wag.).

Hume, "N. and E." 2nd Ed., Vol. I, p. 4; Hume, "S. F.," Vol. V, p. 461; *id.*, Vol. IX, p. 256; *id.*, Vol. XI, p. 256; Hume and Dav., "S. F.," Vol. VI, p. 386; Bing., "S. F.," Vol. IX, p. 190.

This bird is a permanent resident, and is the commonest crow found here. It may be seen everywhere. The breeding season is in January, when it makes a nest composed of sticks roughly placed together, and lays from four to five eggs. BENG. Kala
Kawa.

No. 7. *CORVUS SPLENDENS*.—The Indian House-Crow (Vicill.).

This species is not so common as *C. macrorhynchus*. It is only to be found in the vicinity of villages. Near Hylakandy station great numbers are to be seen, but I have not observed many elsewhere. Unlike *C. macrorhynchus*, it does not frequent the tea-estates. It breeds in May. Kawa.

Genus *Cissa* (Boie, 1826).

No. 14. *CISSA CHINENSIS*.—Green Magpie (Bodd.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 17; Hume and Dav., "S. F.," Vol. VI, p. 385; Bing., "S. F.," Vol. IX, p. 191; Hume, "S. F.," Vol. XI, p. 258. *Cissa speciosa*, Hume, "S. F.," Vol. III, p. 145; *id.*, Vol. IV, p. 509; Bing., "S. F.," Vol. V, p. 85.

This Magpie is a permanent resident and affects forest jungle. It may be generally found in company with *D. paradiseus*, *G. moniliger*, &c. It is very shy and wary, and on account of the colour of its plumage which blends with the green of the jungle it is very difficult to observe. In captivity it is very partial to raw eggs, I have been told by a friend of mine. There has been a great deal written about the change of

colour in the dried skins of this species. Some specimens I procured, but with which I have since parted ; retained, when dry, the greenish-yellow colour on the back, but the feathers of the breast changed to electric blue. However, in all my specimens the red of the wing-coverts faded to a ruddy-brown.

I have never found the nest of this bird, but the Kukis sometimes bring down young birds in April.

Genus *Dendrocitta* (Gould, 1833).

No. 16. *DENDROCITTA RUFÆ*.—The Indian Tree-Pie (Scop.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 19 ; Hume, "S. F.," Vol. XI, p. 259 ; *id.*, Vol. III, p. 146 ; Hume and Dav, "S. F.," Vol. VI, p. 386 ; Bing., "S. F.," Vol. IX, p. 191.

BENG. Lall
Tussar Kata.

This is the common Tree-Pie found here, being seen in numbers in the *bustees*, where small patches of jungle are under cultivation. It breeds here in April and May.

No. 18. *DENDROCITTA HIMALAYENSIS*.—The Himalayan Tree-Pie (Blyth).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 23 ; Hume and Dav., "S. F.," Vol. VI, p. 386 ; Hume, "S. F.," Vol. XI, p. 259.

BENG. Kalee
Tussar Kata.

This Pie is rarer than *D. rufæ*, and keeps more to wooded land and abandoned cultivation. It breeds in June.

Family *Crateropodidæ*.

Sub-Family *Creteropodinae*.

Genus *Dryonastes* (Sharpe, 1883).

No. 62. *DRYONASTES RUFICOLLIS*.—The Rufus-necked Laughing Thrush (J. and S.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 45 ; Inglis, "S. F.," Vol. V, p. 34 ; Hume, "S. F.," Vol. XI, p. 158.

BENG. Hath
Gurri Gurri.

This bird is gregarious and is found in large numbers together. They seem to prefer the undergrowth at the foot of the jungle to the dense jungle itself. They are not shy and will allow close observation ; whilst hopping about, they keep up a continual chatter.

Genus *Garrulax* (Lesson, 1831).

No. 69. *GARRULAX LEUCOLOPHUS*.—The Himalayan White-crested Laughing Thrush (Hardew).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 47 ; Hume, "S. F.," Vol. XI, p. 253 ; Scully, "S. F.," Vol. VIII, p. 289.

This species is very rare in this district. I have only procured one specimen during five years' collecting.

No. 72. *GARRULAX PECTORALIS*.—Black-gorgeted Laughing Thrush (Gould).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 40; Inglis, "S. F.," Vol. II, p. 34; Hume, "S. F.," Vol. III, p. 122; *id.*, Vol. VIII, p. 169; *id.*, Vol. XI, p. 159; Hume and Dav., "S. F.," Vol. VI, p. 291; Oates, "S. F.," Vol. X, p. 208; Bing, "S. F.," Vol. IX, p. 181.

This Laughing Thrush is one of the commonest birds found here. BENG. Bira
Penga. It seems to prefer the jungle bordering on the cultivation, but I have also come across it in dense bamboo jungle accompanying *C. chinensis*, *G. rufulus*, &c. It is gregarious, going about in large numbers, and keeping up its loud chatter like the other Laughing Thrushes.

No. 73. *GARRULAX MONILIGER*.—The Necklaced Laughing Thrush (Hodgs.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 50; Hume, "S. F.," Vol. III, p. 123; *id.*, Vol. XI, p. 160; Hume and Dav., "S. F.," Vol. VI, pp. 291 and 515; Oates, "S. F.," Vol. X, p. 208; Bing, "S. F.," Vol. IX, p. 181.

This bird is just as common as *G. pectoralis*, and its habits are very similar. BENG. Chota
Penga.

Genus *Pomatorhinus* (Horsf., 1821).

No. 116. *POMATORHINUS SCHISTICEPS*.—The Slaty-headed Scimitar-Babbler (Hodgs.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 81; Hume, "S. F.," Vol. III, p. 121; *id.*, Vol. VI, p. 282; *id.*, Vol. IX, p. 251; Scully, "S. F.," Vol. VIII, p. 258; Inglis, "S. F.," Vol. V, p. 31. *Pomatorhinus leucogaster*: Hume, "S. F.," Vol. XI, p. 180.

This is the commonest Scimitar-Babbler we have, being fairly plentiful in the undergrowth at the foot of the Teelaks. They generally go about in small parties, but are rather difficult to shoot both on account of the sombre hue of their plumage and their quick movements. I have seen them sometimes ascending trees, but they prefer the undergrowth. The only eggs I have seen of this species were in the possession of Mr. H. A. Hole. They were of an oval shape, but very pointed at one end, of a pure white colour and very glossy. The average measurement was $1\frac{1}{8}'' \times \frac{3}{4}''$.

No. 131. POMATORHINUS HYPOLEUCUS.—The Arrakan
Scimitar-Babbler (Blyth).

Hume, "S. F.," Vol. III, p. 411; *id.*, Vol. IX, p. 253; *id.*, Vol. XI, p. 152; Inglis, "S. F.," Vol. V, p. 31.

This Scimitar-Babbler is comparatively rare, and is seldom seen unless one is familiar with its call. It is found in dense undergrowth, and seems especially partial to *bêt* (cane) jungle. Only once I saw a pair in the open; they were crossing a clearance near the cultivation. Like *P. schisticeps* they are very difficult to shoot, being always on the move. I have watched these birds carefully several times in the jungle, and have found that the note of the male is lower than that of the female. The notes of this species are quite different from *P. schisticeps*, so that, even if the birds are not visible, it is easily told which species is calling. I have never found them in numbers like *P. schisticeps*, generally going about in pairs. I had intended to make a diligent search for the eggs of this species, but was unfortunately unable to do so having to leave the district before the breeding season. The rufous on the sides of the neck varies greatly in different specimens.

Sub-Family *Timeliinæ*.

Genus *Timelia* (Horsf., 1821).

No. 134. TIMELIA PILEATA.—Red-capped Babbler (Horsf.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 90; Hume, "S. F.," Vol. III, p. 118; Hume and Dav., "S. F.," Vol. VI, p. 267; Oates, "S. F.," Vol. V, p. 152. *Timelia bengalensis*: Hume, "S. F.," Vol. IX, p. 250; *id.*, Vol. XI, p. 143; Oates, "S. F.," Vol. VII, p. 41; Cripps, "S. F.," Vol. VII, p. 277.

This Babbler is fairly common here and seems to prefer reed and long grass jungle. They go about in small flocks and have a very musical note, which they keep uttering the whole time they are on the move.

Genus *Gampsorhynchus* (Blyth, 1844).

No. 137. GAMPSORHYNCHUS RUFULUS.—The White-headed
Shrike-Babbler (Blyth).

Hume, "S. F.," Vol. XI, p. 135.

In young birds the forehead, crown, nape, ear-coverts, and sides of head and neck are light chestnut; the lores, a ring round the eye,

chin, throat and abdomen white; breast slightly fulvous; wing feathers dark brown on inner web and of a golden-brown colour on outer web; tail feathers also golden-brown. The colour of the head generally changes, first of all the tips of the feathers turning white, and then by degrees the remainder turns whiter. I have a very good series of this bird demonstrating the gradual change.

These birds are gregarious, going about in large numbers, and affect dense jungle. They may generally be found in company with *G. pictoralis*, *C. chinensis*, the *Picadæ*, &c. Their note is slightly harsh, and once heard cannot be mistaken. They are not shy, and nearly the whole flock may be procured with a little trouble. They seldom come near the cultivation, but I have seen them once or twice flitting from bamboo to bamboo skirting the tea.

Genus *Pellorneum* (Swains, 1831).

No. 142. PELLORNEUM MANDELLII.—Mandelli's Spotted

Babbler (Blanf.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 99; Hume, "S. F.," Vol. I, p. 298; *id.*, XI, p. 144. *Pellorneum pectoralis*: Hume, "S. F.," Vol. V, p. 340. *Pellorneum nipalense*: Hume, "S. F.," Vol. VIII, p. 188. *Hemipteron nipalense*: Hume, "S. F.," Vol. I, p. 493.

This Babbler is very common, and is generally found in the undergrowth, scraping, among the dead leaves that have fallen, for insects. They make as much noise with their scratching as partridges. I have often been thus misled, thinking they were *A. torqueola*.

Genus *Alcippe* (Blyth, 1844).

No. 163. ALCIPE NEPALENSIS.—The Nepal Babbler (Hodgs.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 104; Hume and Dav., "S. F.," Vol. VI, p. 260; Scully, "S. F.," Vol. VIII, p. 287; Hume, "S. F.," Vol. XI, p. 138.

These birds are very common in the dense jungle and are not at all shy; they may easily be known by the very conspicuous white orbital ring and black supercilium. They generally go about in small flocks, and keep up a constant twittering sound. The eggs are of a pinkish colour mottled with maroon.

Genus *Mixornis* (Hodgs., 1842).

No. 176. *MIXORNIS RUBRICAPILLUS*.—The yellow-breasted
Babbler (Tick.).

Hume "N. and E.," 2nd Ed., Vol. I, p. 115; Hume, "S. F.," Vol. III, p. 118; *id.*, Vol. IX, p. 250; *id.*, Vol. XI, p. 142; Hume and Dav., "S. F.," Vol. VI, pp. 266 and 514; Bing., "S. F.," Vol. IX, p. 180; Oates, "S. F.," Vol. X, p. 207.

This little bird is exceedingly common. I have found it in sparse as well as in dense jungle. It seems to have a preference for creepers; in one place where these were abundant, I could have counted these birds by the score. They are insectivorous. I have often seen them in company with *B. remifer* and *T. affinis*.

Sub-Family *Brachypterygince*.

Genus *Myiophoneus* (Temm., 1823).

No. 187. *MYIOPHONEUS TEMMINCKI*.—The Himalayan
Whistling Thrush (Vigors.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 120; Hume, "S. F.," Vol. I, p. 475; *id.*, Vol. III, p. 106; *id.*, Vol. V, p. 113; Bing., "S. F.," Vol. IX, p. 176; Hume and Dav., "S. F.," Vol. VI, p. 236.

This is the only Whistling Thrush I have found here. They are fairly common, and frequent small dried-up nullahs. They have a very strong whistle, which can be heard from some distance. I have found them rather shy and rather difficult of approach.

Genus *Drymochares* (Gould, 1868).

No. 198. *DRYMOCHARES NEPALENSIS*.—The Nepal Shortwing (Hodgs.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 130; Hume and Dav., "S. F.," Vol. VI, p. 236; Hume, "S. F.," Vol. XI, p. 121.

I have only got two specimens of this bird, and have no notes to give on them.

Genus *Tesia* (Hodgs., 1837).

No. 201. *TESIA CYANIVENTRIS*.—The Slaty-bellied Short-wing (Hodgs.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 131; Hume, "S. F.," Vol. XI, p. 118; Brooks, "S. F.," Vol. VIII, p. 470.

I have only procured a pair of these little birds, and they were both got in the undergrowth. They are very rare, and I have seen no more since procuring this pair.

Sub-Family *Sibiinæ*.

Genus *Zosterops* (V. and H., 1826).

No. 226. *ZOSTEROPS PALPEBROSA*.—The Indian White Eye (Temm.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 140 ; Scully, "S. F.," Vol. VIII, p. 322 ; David, "S. F.," Vol. X, p. 398 ; Hume, "S. F.," Vol. XI, p. 253.

These pretty little birds are very common in the tea gardens, especially when the seed-bushes are in flower. They are generally seen in parties and are insectivorous. I have kept them alive in a cage for a considerable time by putting in an over-ripe plantain, which they seemed to enjoy as well as the small insects which the fruit attracted. Some of the specimens I have are very difficult to distinguish from *Z. simplex*, but I think they are *Z. palpebrosa*.

Sub-Family *Liotrichinæ*.

Genus *Ægithina* (Vicill, 1816).

No. 243. *ÆGITHINA TIPHIA*.—Common Iora (Linn.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 151 ; Hume, "S. F.," Vol. II, p. 459 ; *id.*, Vol. III, p. 129 ; *id.*, Vol. IV, p. 428 ; *id.*, Vol. XI, p. 125 ; Oates, "S. F.," Vol. V, p. 157 ; Bing., "S. F.," Vol. IX, p. 183 ; Dav., "S. F.," Vol. X, p. 387.

This bird is exceedingly common, frequenting the open. I have never shot one in dense jungle. They feed on the insects which they find on small trees. I have never seen them at any great height. In dried skins the golden-yellow fades to a green.

Genus *Chloropsis* (Jard. and Selby, 1826).

No. 247. *CHLOROPSIS AURIFRONS*.—The Gold-fronted Chloropsis (Temm.)

Hume, "S. F.," Vol. III, p. 129 ; *id.*, Vol. XI, p. 184 ; Hume and Dav., "S. F.," Vol. VI, p. 326 ; Bing., "S. F.," Vol. IX, p. 183.

This is by far the commonest *Chloropsis* found here. It may be seen on every ripe-berried tree in company with the bulbuls, barbets, &c. In habits it is decidedly like a bulbul. They also have a liking for the tea-seed gardens when in flower, on account of the numerous insects found there. Sometimes one or two *C. hardwickii* are also in the party, but very seldom. This species can be easily kept alive in an aviary along with bulbuls, &c.

BENG. Hara
Bulbuli.

No. 249. CHLOROPSIS HARDWICKII.—The Orange-bellied Chloropsis (J. and S.).

Phyllornis hardwickii, Hume and Dav. "S. F.," Vol. VI, p. 327 ; Scully, "S. F.," Vol. VIII, p. 297 ; Hume, "S. F.," Vol. XI, p. 185.

This species is very rare. I only procured a pair during five years' collecting, and I was always on the look-out for them.

No. 250. CHLOROPSIS CHLOROCEPHALA.—Burmese Chloropsis (Wald.).

Inglis, "S. F.," Vol. V, p. 35 ; Hume, "S. F.," Vol. III, p. 127 ; *id.*, Vol. XI, p. 184 ; Hume and Dav., "S. F.," Vol. VI, p. 323 ; Bing., "S. F.," Vol. IX, p. 183 ; Oates, "S. F.," Vol. X, p. 211.

This *Chloropsis* is commoner than *C. hardwickii* ; one or two generally being found in company with *C. aurifrons*. Its habits are the same as the other *Chloropsis*.

Genus *Irena* (Horsf., 1821).

No. 254. IRENA PUELLA.—The Fairy Blue-Bird (Lath.)

Hume, "N. and E.," 2nd Ed., Vol. I, p. 157 ; Hume, "S. F.," Vol. III, p. 130 ; *id.*, Vol. XI, p. 186 ; Inglis, "S. F.," Vol. V, p. 35 ; Hume and Dav., "S. F.," Vol. VI, p. 328 ; Mur., "S. F.," Vol. VII, p. 114 ; Hume, "S. F.," Vol. VIII, p. 156 ; Bing., "S. F.," Vol. IX, p. 184 ; Oates, "S. F.," Vol. X, p. 211 ; David, "S. F.," Vol. X, p. 387 ; Taylor, "S. F.," Vol. X, p. 460.

Neela Pakee.

In the young bird the upper plumage has a greenish colour gradually turning to ultramarine. I have noticed these birds in some seasons quite plentifully, and in others I have had hard work to procure even a pair. Their whistle is composed of a single note and is easily remembered. It is very difficult to distinguish the sexes when on high trees, as the ultramarine of the back and under tail-coverts is hidden when the bird is facing you ; the only way to be certain is by the deep black of the breast feathers in the male which are much darker than in the female.

Genus *Melanochlora* (Lesson, 1839).

No. 255. MELANOCHLORA SULTANEA.—The Sultan Bird (Hodgs.).

Hume, "S. F.," Vol. III, p. 143 ; *id.*, XI, p. 256 ; Hume and Dav., "S. F.," Vol. VI, p. 378 ; Scully, "S. F.," Vol. VIII, p. 324 ; Bing., "S. F.," Vol. IX, p. 190 ; Oates, "S. F.," Vol. X, p. 228.

I have only procured a single bird of this species which is exceedingly rare here.

Genus *Mesia* (Hodgs., 1838).

No. 257. *MESIA ARGENTAUROS*.—The Silver-eared *Mesia* (Hodgs.).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 166; Scully, "S. F.," Vol. VIII, p. 318; Hume, "S. F.," Vol. XI, p. 247.

I have only one specimen of this pretty bird. They are very rare here; once only I saw a small flock of them.

Genus *Psaroglossa* (Hodgs., 1844).

No. 261. *PSAROGLOSSA SPILOPTERA*.—The Spotted Wing (Vigors).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 161; Brooks, "S. F.," Vol. III, p. 254; Arms, "S. F.," Vol. IV, p. 334; Hume and Dav., "S. F.," Vol. VI, p. 394; Hume, "S. F.," Vol. XI, p. 268.

This species is very common, numbers being seen on the *Simul* trees (*Bombax*) when in flower. They go about in flocks and breed in holes of trees. They are insectivorous, and feed on the insects to be found in the flowers of the *Simul* tree. I have very seldom seen them except when about trees which are in bloom.

Sub-Family *Brachypodince*.

Genus *Criniger* (Temm., 1820).

No. 263. *CRINIGER FLAVEOLUS*.—The White-throated

Bulbul (Gould).

Hume, "N. and E.," 2nd Ed., Vol. I, p. 163; Hume and Dav., "S. F.," Vol. VI, p. 300; Scully, "S. F.," Vol. VIII, p. 295; Hume, "S. F.," Vol. XI, p. 178.

This Bulbul is very common frequenting more dense jungle than the open, though it is also to be found sometimes in the undergrowth bordering on the cultivation. They are gregarious, going about in small flocks. In crossing a clearance one bird flies across first, followed by the remainder in single file. This species may be easily distinguished by the fine hairs which spring from the nape. They are permanent residents, but I have not come across their nests.

BENG. Chool-wallah Bulbul

Genus *Hemixus* (Hodgs., 1844).

No. 272. *HEMIXUS FLAVALA*.—The Brown-eared Bulbul (Hodgs.).

Hume, "S. F.," Vol. V, p. 3; *id.*, Vol. XI, p. 176; Hume and Dav., "S. F.," Vol. VI, p. 299; Scully, "S. F.," Vol. VIII, p. 295.

This bird is decidedly rare here. I have only come across one small flock in a tea-seed garden, which was in flower. I managed to procure about six specimens, but have not come across any more since then.

(To be continued.)

PREMIERE CONTRIBUTION A LA CONNAISSANCE
DES CHRYSIDIDES DE L'INDE.

PAR

ROBERT DU BUYSSON.

(With Plates Nos. I, II, III, IV and V.)

(Read before the Bombay Natural History Society on 14th Jan., 1896.)

Le premier mémoire est le résultat des récoltes faites par M. R. C. Wroughton, Indian Forest Service, dans l'Hindoustan. J'ai tenu compte également de la collection de la Société d'Histoire Naturelle de Bombay, dont je dois la connaissance à l'amabilité de M. H. M. Phipson. D'autres espèces ont été recueillies par M. J. A. Betham, dans les Provinces Centrales. J'ai ajouté quelques indications prises dans la collection de l'Indian Museum, de Calcutta, que m'a communiquée d'une manière très obligeante par M. E. C. Cotes, de Calcutta. Je veux ici exprimer publiquement à ces chers confrères en Histoire Naturelle, ma plus vive gratitude pour le don généreux qu'ils m'ont fait de ces splendides insectes, qui font l'honneur de mes cartons. Enfin j'ai cru bon de signaler les localités d'où proviennent des spécimens que je possède ou que j'ai eu le loisir d'examiner, Quoiqu'il en soit le nombre des espèces est des plus minimes, pour le moment, puisqu'il ne dépasse pas 26. Aussi dans le but de faciliter l'étude de la famille des *Chrysidides*, je donnerai en tableaux synoptiques les caractères des principales divisions dont on connaît des représentants sur le continent Asiatique.

CARACTERES DE LA FAMILLE.

Les *Chrysididæ*, très voisins des *Proctotrypidæ*, se distinguent par leur corps (à l'état normal) toujours recouvert de couleurs métalliques, leurs antennes insérées par une articulation simple, jamais sur un *torulus*, le clypeus toujours bien développé. Ils sont toujours munis d'ailes, le scutum de leur métathorax (postécusson) n'est jamais nul, leur abdomen a trois ou quatre ou cinq segments dorsaux visibles au repos.

Les femelles ont les segments abdominaux protractiles, formant un tuyau distinct, mais invisible au repos; elles n'ont pas de glandes à venin ni accessoires chez le plus grand nombre (*Chrysididæ*), et rarement elles en sont pourvues (*Cleptidæ*).

Les insectes composant cette famille déposent leurs œufs dans le nid de certains Hyménoptères nidifiants, comme les Euménides, Sphégides, Pompilides, Apides (*Chrysididæ*), ou bien dans le corps même de larves de Tenthredinides (*Cleptidæ*).

SOUS-FAMILLES.

1. Abdomen convexe en dessous, ayant toujours quatre (♀) ou cinq (♂) segments dorsaux visibles.—♀ ayant des glandes à venin et des glandes accessoires. Œufs pondus directement dans des larves de Tenthredinides, dans lesquelles chaque larve de Cleptide doit vivre.—♂ ayant les crochets de l'armure génitale en forme de lames très courtes.1 SOUS-FAMILLE.—CLEPTIDÆ.
2. Abdomen concave en dessous, n'ayant que trois segments dorsaux visibles, (par exception quatre chez les ♂ des *Parnopince*).—♀ dépourvue de glandes à venin et de glandes accessoires. Œufs pondus dans les cellules de certains Hyménoptères nidifiants, où les jeunes larves de Chrysidides mangent celles du nidifiant, à l'exclusion des provisions.—♂ ayant les crochets de l'armure génitale en forme de lames toujours longues.....2 SOUS-FAMILLE.—CHRYSIDIDÆ.

1^{re} SOUS-FAMILLE : CLEPTIDÆ.

La sous-famille des Cleptides ne renferme, pour la faune Asiatique qu'un seul genre, celui des *Cleptes*, Latreille. (Pl. I.) Ces insectes au corps grêle, allongé, et déprimé, vivent sur les feuillages et les herbes dans les endroits abrités et exposés au soleil ; ils butinent sur les fleurs à corolles peu profondes, comme les Ombellifères ; ils léchent aussi les exsudations sucrées que sécrètent certains feuillages.

Plusieurs espèces ont été rapportées de l'Asie, tels que : *Cleptes Morawitzi* Rad. du Turkestan, *Cleptes semiaurata* L. (Pl. I, fig. 5), du Turkestan et de Sibérie, *Cleptes syriaca* Buyss., de Syries, etc. II est donc permis de supposer que l'Inde doit en nourrir quelques unes.

II^e SOUS-FAMILLE : CHRYSIDIDÆ.

Cette sous-famille très nombreuse, se divise naturellement en trois tribus parfaitement distinctes, dont voici le tableau.

1. Ongles des tarses armés de plusieurs crochets ; stigmates méta-thoraciques situés en dessus des angles postico-latéraux, près de l'insertion des ailes inférieuresELLAMPINÆ Mocs.—Buyss.
- Ongles des tarses simples2

2. Machoires et languette de la bouche courtes, retractées au repos ;
palpes labiaux de trois articles, palpes maxillaires de cinq articles ;
stigmates méta-thoraciques situés en dessous des angles postico-
latéraux.....CHRYSIDINÆ Mocs.

Machoires et languette de la bouche très allongées, linéaires, en
forme de trompe, repliées en dessous du thorax au repos ; palpes
labiaux et maxillaires composés de un ou deux articles seulement ;
stigmates méta-thoraciques situés en dessus des angles postico-
latéraux.....PARNOPINÆ Aaron.

PREMIERE TRIBU : *ELLAMPINÆ* Mocs.—Buyss.

Les insectes compris dans cette tribu, sont de petite taille, plus ou
moins convexes, épais et larges. Ils se séparent en sept genres pour
la faune de l'Asie.

1. Ongles des tarses armés de plus de deux crochets.....2
Ongles des tarses armés de deux crochets seulement.....6
2. Première et troisième cellules discoïdales indistinctes ou incom-
plètes3
Première et troisième cellules discoïdales figurées par une ligne
brunie.....HOLOPYGA Dahlb.
3. Postécusson prolongé en lame horizontale.....NOTOZUS Först.
Postécusson non prolongé en lame.....4
4. Côtés du pronotum étroitement appliqués chacun contre la tranche
antérieure des mésopleures, ces côtés aussi longs que cette tranche ;
pas d'angles postico-latéraux aux métapleures, extrémité apicale
du 3^e segment abdominal très entièreHOLOPHRIS Mocs.
Côtés du pronotum non appliqués contre la tranche antérieure des
mésopleures et beaucoup plus courts que cette tranche ; des angles
aigus assez forts aux métapleures ; extrémité apicale du 3^e segment
abdominal incisée ou plus ou moins sinuée5
5. Pronotum convexe ; tibias postérieurs normaux ; 3^e segment
abdominal incisé ou émarginé à l'apexELLAMPUS Spin.
Pronotum déclive en avant ; tibias postérieurs dilatés, surtout
chez le ♂ qui les a, en outre, subcreusés en dessous ; 3^e segment
abdominal très légèrement sinué à l'apex.....PHILOCTETES
Ab.—Buyss.
6. Ongles des tarses terminés par un seul crochet, mais ayant en leur
milieu un autre petit crochet plus petit, placé en angle droit ;
3^e segment abdominal sans angles sur les côtés.....
HEDYCHRIDUM Ab.

7. Ongles des tarsi terminés par deux crochets joints à leur base ;
3^e segment abdominal ayant de chaque côté un petit angle saillant
dirigé en arrière ... HEDYCHRUM Latr.

Genre NOTOZUS Först. (Pl. J.)

Il est certain que l'Inde doit posséder des *Notozus* bien que je n'en ai pas vus de cette provenance. Le Turkestan et l'Amur ont fourni le *N. superbus* Ab., la Mongolie le *N. Mocsaryi* Rad., l'Asie-Mineure le *N. ruftarsis* Toum. On a rapporté aussi du Turkestan les *N. Eversmanni* Mocs., et *N. violascens* Mocs., de Merw le *N. Komarovi* Rad., etc.

Genre ELLAMPUS Spin. (Pl. I.)

Aucune espèce à signaler de l'Inde, bien que l'on ait l'*E. Wesmaeli* Chevr. de Sibérie, les *E. Magretti* Buyss. et *E. Medanai* Buyss. de Syrie, l'*E. auratus* L. (Pl. I., fig. 11) du Turkestan et de Syrie, les *E. truncatus* Dhlb. et *E. æneus* Panz. du Turkestan. La variété *pygialis* Buyss. de cette dernière espèce habite la Chine, les *E. imbecillus* Mocs. et *E. pusillus* F. la Perse et le Turkestan, les *E. turkestanicus* Mocs. et *E. cæruleus* Dahlb. le Turkestan, l'*E. hypocrita* Buyss. la Perse et la Mongolie, etc.

Genre PHILOCTETES Ab.—Buyss.

Quant aux *Philoctetes*, il n'y a que le *Ph. tiberiadis* Ab.—Buyss., de Syrie, que l'on puisse indiquer comme Asiatique, mais rien ne semble s'opposer à une aire de dispersion plus grande.

Genre HOLOPHRIS Mocs.

Le genre *Holophris* récemment créé par M. le Dr. A. Mocsary (Addit. 1^{um} ad. Mon. Chrys. o. t. u. p. 51, 1890), ne comprend qu'une seule espèce, l'*H. marginellus* Mocs. qui habite Sumatra.

Genre HOLOPYGA Dahlb. (Pl. I.)

Nous avons une espèce appartenant à ce genre à enregistrer pour notre faune Indienne.

1. *H. Indica* Mocs.

(Mon. Chrys. orbis terr. univ. 1889, p. 118). (Pl. I, fig. 12.)

♀ Provinces Centrales (J. A. Betham); ♂ Bangalore (ma collection).

Genre HEDYCHRIDIUM Ab. (Pl. II.)

Une seule espèce de ce genre. Elle a été découverte par M. R. C. Wroughton, à qui je suis heureux de la dédier en reconnaissance de sa générosité à mon égard.

2. *H. Wroughtoni* n. sp. (Pl. II., fig. 6.)

Corps robuste, déprimé, entièrement vert-gai, avec des reflets bleuissants sur l'abdomen et l'aire médiane du mesonotum. Pubescence fine, brun-roussâtre, légèrement couchée. Antennes brunâtres, les deux premiers articles verts. Pronotum long, déprimé, à côtés convergents en avant, la ponctuation médiocre, serrée, irrégulière, profonde ; celle du reste du thorax plus grosse et moins serrée, devenant grosse et réticulée sur le postecusson et les mésopleures. Ailes enfumées ; pattes vertes avec les articulations et les tarses brun-roussâtres. Abdomen assez convexe, à points fins, espacés, le 3^e segment entier, la bordure extrême très caractéristique, amincie, canaliculée, puis légèrement relevée. Ventre vert, les segments largement marginés de noir. ♀ Long. 7½ mill. Provinces Centrales (R. C. Wroughton).

Genre HEDYCHRUM Latr. (Pl. II.)

Messieurs R. C. Wroughton et H. M. Phipson m'ont envoyé plusieurs exemplaires d'un *Hedychrum* déjà connu de Smith et que j'ai signalé de Birmanie (Rev. d'Ent. T. X. No. 3, p. 30, 1891.)

3. *H. flammulatum* Sm.

(Journ. Proc. Linn. Soc. Zool. III, p. 26, 1859).

Le ♂ a la ponctuation thoracique plus forte que la ♀, et réticulée ; celle de l'abdomen est également plus grosse et plus espacée.

Le coloris, chez les deux sexes, varie du vert-gai au bleu-indigo ; la taille également varie de 4 à 6 millimètres.

♀ ♂ Provinces Centrales ; Présidence de Bombay : Poona (R. C. Wroughton).

DEUXIÈME TRIBU : *CHRYSIDINÆ* Mocs.

Cette tribu est la plus nombreuse et c'est à elle qu'appartiennent les espèces les plus communes. Les insectes qui la composent vivent de matières sucrées : nectar des fleurs, exsudations des feuilles, déjections de pucerons, etc. Leur vivacité augmente en raison de la chaleur de l'atmosphère. Ils prennent leurs ébats partout où le soleil chauffe, sur les feuillages, les murs, les bois morts, les tertres des chemins et des fossés, les arbres secs, les carrières, les tas de pierres, les galets anciens les berges des rivières, les côtes arides, etc. Dans les endroits les plus fréquentés par les Hyménoptères nidifiants, dans le nid des quels ils déposent leur progéniture.

La tribu des *Chrysidinæ* se divise en cinq genres.

1. Première cellule discoïdale des ailes supérieures incomplète
CHRYSOGONA Först.
Première cellule discoïdale des ailes supérieures complète.....2
2. Corps de grande taille ; yeux occupant plus des deux tiers de la
largeur de la face ; épistome prolongé en un long bec à côtés
subparallèlesSTILBUM Spin.
Corps de taille variable ; yeux n'occupant jamais plus des deux tiers
de la largeur de la face ; épistome jamais prolongé en un long bec à
côtés subparallèles.3
3. Cellule radiale des ailes supérieures très incomplète, ouverte au
moins d'un tiers de sa longueur présumée ; marge apicale du 3e
segment abdominal entière ou bordée de fines aspérités saillantes.
SPINOLIA Dahlb.—Buyss.
Cellule radiale des ailes supérieures complète ou n'étant jamais
ouverte de plus d'un quart de sa longueur ; marge apicale du 3e
segment abdominal jamais bordée de fines aspérités saillantes.....4
4. Troisième segment abdominal entier ou ondulé ou bien muni
d'angles ou de dents, ces dernières au nombre de un à six.....
CHRYSIS Linné.
5. Troisième segment abdominal denticulé en scieEUCHRÆUS
Latreille

Genre CHRYSOGONA Först. (Pl. II.)

4. *C. assimilis* Dahlb.

(*Hym. Eur. II.*, p. 201, 1854.) (Pl. II, fig. 10.)

♂ Présidence de Bombay : Poona (R. C. Wroughton).

Genre SPINOLIA Dahlb.—Buyss. (Pl. II.)

On pourrait trouver dans l'Inde les *Spinolia Morawitzi* Mocs. et
S. magnifica Dahlb. qui habitent l'Asie occidentale.

Genre EUCHRÆUS Latr. (Pl. II.)

Il en est de même des *Euchræus limbatus* Dahlb., *E. purpuratus* F.
et *E. pellucidus* Rad.

Genre CHRYSIS L. (Pl. II et III.)

Pour pouvoir déterminer plus facilement les *Chrysis* on divise ce genre
en plusieurs phalanges suivant la forme du 3^e segment abdominal et le
nombre de dents qui le termine. De plus, dans chacune de ces phalanges
je distingue cinq sections suivant la couleur.

TABLEAU des PHALANGES.

- Marge apicale du 3^e segment abdominal entière ou subtronquée, pouvant être parfois plus ou moins émarginée au milieu, mais nullement ondulée et sans angles sur les côtés ni au commencement de la série antéapicale PHAL. I. INTEGERRIMÆ.
- Marge apicale du 3^e segment abdominal distinctement trisinuée ou ondulée et pouvant former un angle de chaque côté avant ou après le commencement de la série antéapicale...PHAL. II. INÆQUALES.
- Marge apicale du 3^e segment abdominal plus ou moins nettement acuminée à l'apexPHAL. III. UNIDENTATÆ.
- Troisième segment abdominal avec une dent ou un angle distinct de chaque côté, avant ou après la naissance de la marge apicalePHAL. IV. BIDENTATÆ.
- Marge apicale du 3^e segment abdominal avec trois dents distinctes, dont une à l'apexPHAL. V. TRIDENTATÆ.
- Troisième segment abdominal muni de quatre dents ou angles distinctsPHAL. VI. QUADRIDENTATÆ.
- Troisième segment abdominal avec cinq dents ou angles.....PHAL. VII. QUINQUEDENTATÆ.
- Troisième segment abdominal avec six dents ou angles..PHAL. VIII. SEXDENTATÆ.

TABLEAU DES SECTIONS.

1. Corps en entier ou à moitié noir-bronzé, terne, plus ou moins violacé-obscur, ou avec quelques reflets métalliques.....
I. OBSCURATÆ.
- Corps ni entièrement ni en notable partie noir.....2
2. Corps entièrement vert ou bleu, ou avec ces couleurs mélangées ou vert-gaiII.—VIRIDES.
- Corps avec des parties dorées3
3. Abdomen ayant ou moins un segment entièrement vert ou bleu.
III.—ZONATÆ.
- Abdomen plus ou moins entièrement doré, sans aucun segment entièrement vert ni bleu.....4.
4. Avant-corps sans partie feu ni doréIV.—BICOLORES.
- Avant-corps entièrement ou en partie feu ou doré-verdâtre ou doré-cuivréV.—AURATÆ.

Je ne me servirai pas des Sections ici, afin de pouvoir me conformer au désir de M. R. C. Wroughton, qui m'a prié de mettre les espèces en tableaux, ce que je ne pourrais pas faire autrement, vu leur petit nombre.

Phal. I. *INTEGERRIMÆ.*

1. Corps entièrement bleu et vert, sans partie feu ; fouet des antennes roux-testacé en dessous.....C. CAPITALIS Dhlb.
—Corps avec quelques parties feu ou dorés2
2. Corps entièrement bleu ou bleu-vert, sauf l'écusson et le postécusson qui sont doré-feu..... C. WROUGHTONI n. sp.
—Corps autrement coloré.....3
3. Pronotum et écusson feu-doré ; apex du 3^e segment abdominal légèrement sinué.....C. BAYADERA n. sp.
—Pronotum et écusson verts ; apex du 3^e segment abdominal parfaitement arrondi, nullement sinué.....
C. DISSIMILANDA n. sp.

5. *C. capitalis* Dhlb.

(*Hym. Eur. II.* p. 100, 1854.)

♂ Aden (col. Yerbury).

6. *C. Wroughtoni* n. sp. (Pl. III, fig. 2).

Corps étroit, allongé, subparallèle, entièrement bleu ou bleu-vert, avec des places plus bleues, l'écusson et le postécusson doré-feu ; pubescence fine, gris-roussâtre. Tête pas plus large que le pronotum, épaisse, arrondie, à points médiocres, serrés, devenant réticulés sur le front ; cavité faciale plus verte, large, plus finement ponctuée, terminée en haut par une carène transversale, arquée-arrondie près des yeux ; joues très courtes ; antennes brun-noirâtre, les trois premiers articles bleus, le 3^e deux fois long comme le 4^e. Pronotum subcylindrique ; ponctuation thoracique médiocre, serrée, ruguleuse, subréticulée ; celle du métathorax grosse, réticulée ; angles postico-latéraux du méta-thorax à pointe recourbée, aigüe. Ecaillettes bleues, subscariées ; ailes subhyalines, à nervures roux-subtestacés ; pattes vertes, tarses brunâtres. Abdomen allongé, subcylindrique, légèrement caréné, à ponctuation médiocre, assez serrée, subréticulée ; angles postico-latéraux du 2^e segment arrondis ; 3^e segment régulièrement convexe, à points plus gros ; série antéapicale obsolètement creusée, 10 fovéoles médiocres,

rondes, ouvertes, séparées ; marge apicale longue, régulièrement entière, à bordure mince, subscarieuse, débordante sur les côtés à sa naissance, de manière à former un sinus avec les côtés du segment qui sont convergents en arrière. Ventre bleu-vert, taché de noir. ♀ Long. 6-7 mill.

Cette espèce peut-être atteinte de rufinisme dans les antennes, la nervulation des ailes et les pattes.

Présidence de Bombay : Poona (R. C. Wroughton).

7. *C. bayadera* n. sp. (Pl. III. fig. 1).

Corps étroit, subparallèle, entièrement vert-gai ou vert-bleu, avec le vertex, l'aire médiane du mésonotum, la base du 2^e segment abdominal et tout le 3^e segment, bleu-foncé, parfois même noir-bleu ; le pronotum, l'écusson et la moitié apicale du 2^e segment abdominal feu-doré. Pubescence fine, blanchâtre. Tête épaisse, arrondie, cavité faciale vert-doré, étroite, finement ponctuée, couverte de poils blancs, terminée en haut par des traces de carène transversale ; joues médiocres, convergentes en avant, antennes marron, les deux premiers articles bronzé verdâtre, le 3^e un peu plus long que le 4^e. Ponctuation de l'avant-corps médiocre, serrée, subcoriacée, entremêlée de points fins ; pronotum subcylindrique ; postécusson avec la suture antérieure béante ; angles postico-latéraux du méta-thorax triangulaires, à pointe obtuse, droite. Ecaillettes marron, ailes un peu enfumées ; pattes vertes, tarsi marron-roussâtre. Abdomen large, légèrement caréné, un peu déprimé, à ponctuation médiocre, serrée, subcoriacée, irrégulière, entremêlée de points fins ; les angles postico-latéraux du 2^e segment arrondis ; 3^e segment régulièrement convexe, les côtés droits et continus avec ceux de la marge apicale ; série antéapicale très peu creusée, 12 fovéoles petites, subtransversales, ouvertes, subconfluentes ; marge apicale courte, légèrement sinuée à l'apex. Ventre vert, taché de noir. ♂ Long. 7-8 mill.

La ♀ diffère du ♂ par les teintes plus vives, les joues longues, le 3^e article antennaire plus long, coloré de bleu, le 3^e segment abdominal plus allongé, et le ventre bleu.

Provinces centrales ; Poona (R. C. Wroughton).

8. *C. dissimilanda* n. sp.

Semblable à la *C. bayadera*, dont elle diffère par son coloris qui ne montre pas de couleur feu-doré, une légère teinte dorée se distingue

seulement sur la bordure apicale du 2^e segment abdominal et sur les côtés du 1^{er}. La ponctuation de l'avant-corps n'est point coriacée et peu serrée ; la face large, non rétrécie à la base, les joues presque nulles, pronotum plus court et plus convexe, les angles postico-latéraux du méta-thorax tres petits, à pointe divariquée, obtuse ; les tarses subtestacés ; le 3^e segment abdominal régulièrement arrondi, nullement sinué à l'apex. Ventre vert-gai avec deux tâches bleu-foncé sur le 2^e segment. Long. 5½ mill.

Présidence de Bombay : Poona (R. C. Wroughton).

Phal. V.TRIDENTATÆ

1 Côtés du pronotum profondément sinués au milieu, puis distinctement anguleux avant les angles antérieurs ; abdomen déprimé ; côtés du 3^e segment abdominal continus avec ceux de la marge apicale et formant avec ceux-ci une ligne droite ...

TRIACANTHA Mocs.

—Côtés du pronotum légèrement sinués au milieu ; abdomen convexe ; côtés du 3^e segment abdominal séparés de ceux de la marge apicale par un petit angle arrondi qui se trouve à sa naissance.....

SCIOËNSIS Grib.

9. *C. triacantha* Mocs.

(*Mon. Chrys. orb. ter. univ.* p. 325, 1889.)

♀ Calcutta (ma collection). Je la possède aussi d'Amboine.

10. *C. Scioënsis* Grib.

(*Ann. Mus. Civ. Stor. Nat. Genova.* XIV, p. 344, 1879.)

Il faut ajouter à la description de mâle incomplet que j'ai décrit dans le *Species des Hym. T. VI.*, p. 434 ; "tarses blanchâtres, brunis à l'extrémité." ♂ ♀ Aden (Col. Yerbury).

Phal. VI.QUADRIDENTATÆ.

1 Abdomen entièrement feu-doré, avec la marge apicale du 3^e segment bleue.....ZOBÉIDA n. sp.

—Abdomen autrement coloré2

2 Aires latérales du mésonotum et deux taches apicales sur le segment abdominal feu-doréSPECULATA n. sp.

Corps entièrement bleu ou bleu-vert, sans tâches feu3

- 3 Tête tres petite, moins large que le pronotum, le 1^{er} ocelle enfermé dans une aire creuséeFUSCIPENNIS Brullé
 —Tête de la largeur du pronotum, le 1^{er} ocelle jamais enfermé dans une aire creusée4
 4 Ailes assez fortement enfumées, bleuissantes ; corps cylindrique, entièrement vert-gai, parfois plus bleu sur le 3^e segment abdominal, dents de ce dernier segment obtuses
 COTESI Buyss.
 —Ailes hyalines ou sub-hyalines ; toujours des parties du corps plus bleues ; dents du 3^e segment abdominal longuement aigues. 5
 5 Corps cylindrique, vert-gai, la base des segments abdominaux 2 et 3 bleu-vif ; série antéapicale du 3^e segment abdominal presque nulleOBLITERATA Mocs.
 —Corps non cylindrique, bleu avec des espaces verts ou vert-bleu ; série antéapicale du 3^e segment abdominal creusée et bien distincte..... SERAXENSIS Rad.

11. *C. fuscipennis* Brullé.

(Hym. IV, p. 38, 1846.)

♂ ♀ Provinces Centrales (J. A. Betham) ; Présidence de Bombay : Poona (R. C. Wroughton) ; Bangalore (E. C. Cotes) ; Pondicherry (Edm. André).

Var. *mossullensis* Ab.—Buyss.

(Rev. d'Ent. T. VI, p. 190, 1887.)

Poona (R. C. Wroughton) ; Mysore (P. H. K. Lee.)

Var. *dorsata* var. nov.

Diffère du type par tout le dorsulum du thorax qui est noir-bronzé-cuivré. Parfois même cette teinte cuivrée s'étend sur les deux premiers segments de l'abdomen et les pattes. ♀ Long. 9—11½ mill.

Présidence de Bombay : Poona (R. C. Wroughton).

12. *C. Cotesi*, Buyss.

(Rev. d'Ent. T. XII, p. 249, 1893.)

♂ ♀ Varie du vert-gai un peu doré, principalement sur l'écusson, au bleu-vert.

Poona, Kanara, S. Guzerat, Provinces Centrales (R. C. Wroughton) ; Bangalore (E. C. Cotes) ; Mysore (P. H. K. Lee).

13. *C. oblitterata*, Mocs.

(Mon. Chrys. orb. terr. univ. p. 377, 1889.—*C. orientalis* Dahlb.
(nec Guérin.)

On doit compléter la description de Dahlbom par ce qui suit. Corps subcylindrique ; tête épaisse, arrondie ; cavité faciale terminée en haut par une légère carène transversale peu apparente ; joues médiocres, convergentes en avant ; mandibules bidentées ; antennes brunes, avec les trois premiers articles bleu-vert ou bleus, le 3^e un peu plus long que le 4^e ; pronotum subcylindrique, à côtés convergents en avant ; ponctuation de l'avant-corps médiocre, ruguleuse, irrégulière, médiocrement serrée ; angles postico-latéraux du métathorax petits, triangulaires, aigus ; tarses marron-roussatre ; abdomen subcylindrique, à points médiocres, espacés, entremêlés de petits points ; angles postico-latéraux du 2^e segment arrondis. ♀ Long. 6-6½ mill.

Le ♂, resté inédit, diffère de la ♀ par la cavité faciale plus courte, les antennes marron-roussatre, le 3^e article subégal au 4^e ; par la ponctuation plus grosse, les tarses roussatres, le 3^e segment abdominal plus court. Parfois une teinte cuivrée recouvre l'écusson, le pronotum, la poitrine, les pattes et le 1^{er} segment abdominal.

Provinces Centrales (J. A. Betham) ; Présidence de Bombay : Poona (R. C. Wroughton).

14. *C. serawensis* Rad.

(Rev. d'Ent. T. X. p. 195, 1891.)

Varie comme taille de 4½ à 6 millimètres. Les plus petits individus ont ordinairement des reflets vert-doré un peu feu sur les côtés des segments 1 et 2 de l'abdomen, et leurs tarses sont roussatres. Le ♂ seul a été décrit ; la ♀ a le 3^e segment abdominal plus long, et dès lors les côtés le sont aussi.

♀ Provinces Centrales (J. A. Betham) ; Poona (R. C. Wroughton).

Var. *viridipes* var. nov.

Diffère du type par sa taille un peu plus forte et les tarses brunatres, le 1^{er} article des postérieurs verts en dessus. ♀ Long. 7½ mill.

Provinces Centrales (J. A. Betham).

15. *C. speculata* n. sp.

Corps de taille médiocre, robuste, un peu déprimé, rappelant la forme de la *C. Grohmanni* Dahlb., vert-bleu avec les aires latérales du

mésोनотum, les côtés du 1^{er} segment abdominal, deux grandes tâches latérales sur le 2^e et deux autres plus petites sur le 3^e feu-doré ; le vertex, l'aire médiane du mésонотum et la base des segments abdominaux 2 et 3 bleu-foncé ; pubescence longue, blanchâtre. Cavité faciale courte, large, recouverte d'épais poils blancs, le haut terminé par une double carène transversale ; joues très courtes, fortement convergentes en avant ; mandibules simples ; antennes noirâtres, les deux premiers articles et la base du 3^e verts, le 3^e presque aussi long que les deux suivants réunis ; pronotum très court, convexe, la partie antérieure déclive ; ponctuation de l'avant-corps médiocre, irrégulière, un peu ruguleuse, modérément serrée ; postécusson convexe ; angles postico-latéraux du méta-thorax petits, à pointe obtuse ; écailles marron, scarieuses ; ailes hyalines ; pattes vertes, un peu doré-feu sur les genoux, hérissées de gros poils blancs, tarses bruns. Abdomen ovale, à points médiocres, serrés, entremêlés de plus fins ; angles postico-latéraux du 2^e segment arrondis ; 3^e segment à gros points réticulés, espacés, peu convexe, les côtés longs, droits ; série antéapicale peu creusée à l'apex, d'avantage sur les côtés, 10 fovéoles ouvertes, médiocres, irrégulières, subconfluentes ; marge apicale quadri-dentée : dents subscarieuses, triangulaires subaigues, disposées sur une ligne très courbe, les internes plus rapprochées entre elles, les externes plus courtes, séparées des internes, et des côtés de la marge de chaque côté par un large sinus arrondi l'émarginature médiane beaucoup plus petite et triangulaire, les côtés de la marge débordants à la naissance de celle-ci et formant de chaque côté un petit angle. Ventre vert-bleu, taché de noir. ♀ Long. 6 mill.

Présidence de Bombay : Poona (R. C. Wroughton).

16. *C. Zobeida* n. sp.

Corps de taille médiocre, assez convexe, tout l'avant-corps vert-bleu, l'abdomen feu-doré teinté de verdâtre, avec la marge apicale du 3^e segment bleue ; pubescence blanchâtre. Semblable à la *C. Fertoni* Buyss. dont elle en diffère cependant, en outre du coloris, par les caractères suivants. Antennes rousses ; tarses roux-testacé, le 1^{er} article presque blanchâtre ; thorax beaucoup plus convexe, à ponctuation moins profonde, irrégulière, entremêlée de points fins, non réticulée et espacée ; pronotum déclive antérieurement, à côtés convergents en avant, ailes parfaitement hyalines ; ponctuation abdominale plus grosse et espacée. ♀ Long. 6½ mill.

Aden (Col. Yerbury).

Phal. VII.QUINQUEDENTATÆ.

- 1 Postécusson mucroné ; antennes avec les articles 6-8 aplatis, deux fois plus larges que longs ; bouche tres petite.2
- Postécusson convexe ; antennes entièrement cylindriques, les articles 6-8 à peine une fois et demie plus longs que larges ; bouche normale.....3
- 2 Taille grande ; angles postico-latéraux du 2^e segment abdominal droits, nullement spinoides ; mésopleures avec deux dents en dessousCRASSISCUTA MocS.
- Taille moyenne ; angles postico-latéraux du 2^e segment abdominal distinctement spinoides, bien que à pointe obtuse ; mésopleures sans dents distinctes en dessous.....SHANGAIENSIS Sm.
- 3 Abdomen assez distinctement caréné dans sa longueur, 2^e segment avec une tâche feu-doré de chaque côté ; série anté-apicale du 3^e segment large, profondément creusée, les fovéoles largement ouvertes.LUSCA Fabr.
- Abdomen sans traces de carène, 2^e segment entièrement bleu vert ; série antéapicale du 3^e segment indistinctement creusée les fovéoles punctiformes, tres petites.LIBITA n. sp.

17. *C. crassiscuta* MocS.

(*Mon. Chrys. orb. terr. univ. p. 524, 1889.*)

♀ Calcutta (ma collection) ; Indes orientales (H. de Saussure).

18. *C. shangaiensis* Sm.

(*Transact. Ent. Soc. Lond. p. 460, 1874.*)

Pour compléter la description de Smith, il faut ajouter ce qui suit.
Corps large et robuste ; ponctuation de l'avant-corps grosse et réticulée ; tête transversale, plus épaisse que le pronotum ; cavité faciale large, très profonde, terminée en haut par une forte carène arquée ; bouche très petite, mandibules minuscules, bidenticulées ; clypeus très réduit, profondément émarginé, joues longues et fortement convergentes en avant ; antennes élargies, fortement aplaties en dessous, surtout au milieu du fouet, les trois premiers articles verts, le 3^e subégal aux trois suivants réunis, pronotum très court, fortement déclive en avant, les angles antérieurs petits, aigus ; mésopleures profondément creusées-sculptées en dessous, mais sans dents distinctes ; les angles postico-

latéraux du méta-thorax très grands, à peine recourbés, subaigus ; abdomen à points gros, espacés ; angles postico-latéraux du 2^e segment distinctement spinoides, à pointe obtuse ; 3^e segment avec la partie apicale infléchie, sans série antéapicale distincte, on voit seulement 4 ou 5 petites fovéoles punctiformes ; les cinq dents sont triangulaires, finement aigues à pointe légèrement relevée : tarses postérieurs vert-doré. ♀ Long. 10 mill.

Il me semble que cette espèce est parfaitement distincte de *C. mandarina* Mocs et *C. himalayensis* Mocs.

Mergui (ma Collection).

19. *C. lusca*, F.

(*Syst. Piezat.* p. 171, 1804.)

♀ Provinces Centrales : Raipur (J. A. Betham) ; Bangalore (E. C. Cotes) ; Rajabrampoor (E. Abeille de Perrin) ; Pondichéry (Edm. André) ; Mysore (P. H. K. Lee).

20. *C. libita* n. sp.

Corps de taille moyenne, robuste, large, entièrement vert-bleu, avec l'occiput et l'aire médiane du mésonotum plus bleus ; ponctuation assez grosse, assez serrée, subréticulée, entremêlée de points fins ; pubescence fine, brune, dressée. Tête épaisse, cavité faciale assez profonde, recouverte de poils blancs, le haut caréné ; mandibules bidentées ; antennes normales, brunes, les trois premiers articles verts, le 3^e un peu plus long que le 4^e. Pronotum court, déclive antérieurement, les côtés brusquement convergents en avant dans le tiers antérieur ; écusson et postécusson convexe, grossièrement réticulés, les mésopleures profondément creusées-sculptées, sans dents distinctes ; écailles bleues ; ailes un peu enfumées, hyalines à l'extrémité ; angles postico-latéraux du méta-thorax grands, droits, subobtus ; pattes vertes, tarses brun-roux. Abdomen large, convexe, les angles postico-latéraux du 2^e segment subspinoides, subobtus ; 3^e segment convexe, les côtés convergents en arrière, presque droits ; série antéapicale obsolète, à fovéoles petites, punctiformes, espacées, peu nombreuses ; marge apicale courte, cinq fois dentée, les dents disposées sur une ligne courbe et large, très petites, triangulaires, subaigues, celle du milieu plus courte, les deux émarginatures médianes égales, peu profondes, arrondies, les deux autres plus larges, à fond subrectiligne, les côtés de la marge arrondis,

peu distincts de ceux du segment. Ventre bleu-vert taché de noir.

♂ Long. $9\frac{1}{2}$ mill.

Présidence de Bombay : Poona (R. C. Wroughton).

Phal. VIII....., *SEXDENTATÆ*.

1. Troisième article antennaire au moins de moitié plus court que le 4^e2

—Troisième article antennaire subégal au 4^e ou plus long que celui-ci3

2. Postécusson avec un mucron creusé en dessus; mésopleures avec deux dents en dessous. ♂ ♀ entièrement vert-bleu ou bleus*ORIENTALIS* Guér.

—Postécusson simplement gibbeux, sillonné longitudinalement; mésopleures avec une seule grande dent en dessous; ♀ avec deux taches feu-doré sur les côtés du 2^e segment abdominal...

OCULATA F.

3. Deux taches feu-doré latérales sur le 2^e segment abdominal; postécusson un peu gibbeux, subcreusé au sommet par une forte ponctuation ... *SCHIÖDTEI* Dahlb.

—Corps entièrement bleu-vert ou vert-bleu; postécusson convexe, nullement creusé au sommet.....*PRINCIPALIS* Sm.

21. *C. orientalis* Guér.

(*Rev. Zoolog. p. 146, 1842.*)

La ♀ restée inédite diffère du ♂ par les joues un peu plus longues, la ponctuation un peu moins ruguleuse, le 3^e segment abdominal plus long, plus distinctement renflé avant la série antéapicale, cette dernière plus creusée, les dents disposées sur une ligne plus arquée.

Cette espèce varie du vert-gai au vert-bleu et au bleu; les joues sont parallèles, les angles postico-latéraux du 2^e segment abdominal sont spinoides à pointe aigue, le premier article des tarses postérieurs et intermédiaires sont verts en dessus, le 2^e segment abdominal porte de chaque côté, à sa base, une petite tache bleu-foncé.

♀ ♂ Provinces Centrales : Raipur (J. A. Betham); Présidence de Bombay : Poona (R. C. Wroughton); Mysore (P. H. K. Lee).

22. *C. oculata* F.

(*Syst. Ent. p. 357, 1775.*)

Je n'ai jamais vu qu'un seul mâle de cette espèce. Il se distingue de la femelle par le 3^e segment abdominal plus court, largement tronqué

arrondi, moins déprimé à sa base ; le 2^e segment ne porte pas de tâches feu, mais seulement un léger reflet vert un peu doré à la place où celles-ci devraient être.

M. Wroughton l'aurait obtenu d'éclosion de nid d'*Eumenes conica* ?

♂ ♀ Calcutta (E. C. Cotes) ; Poona (R. C. Wroughton) ; Raipur (J. A. Betham) ; Pondichéry (Edm. André) ; Mysore (P. H. K. Lee).

23. *C. Schiödtei* Dahlb.

(*Hym. Eur. II*, p. 309, 1854.)

♂ ♀ Margherita (E. C. Cotes) ; Raipur (J. A. Betham), Poona (R. C. Wroughton) ; Pondichéry (Edm. André).

24. *C. principalis* Sm.

(*Transact. Ent. Soc. Lond. p.* 461, 1874.)

♂ Présidence de Bombay : Poona (R. C. Wroughton).

Genre STILBUM Spin. (Pl. III et IV.)

25. *S. splendidum* F.

(*Syst. Ent. p.* 357, 1775.) (*Pl. III, fig.* 12.)

♂ ♀ Calcutta (E. C. Cotes) ; Surat, Poona, S. Guzerat (R. C. Wroughton) ; Raipur (J. A. Betham) ; Pondichéry (Edm. André) ; Mysore (P. H. K. Lee).

Var. *amethystinum* F.

(*Syst. Ent. p.* 359, 1775.)

♂ ♀ Calcutta (E. C. Cotes) ; Surat, Poona (R. C. Wroughton) ; Raipur (J. A. Betham) ; Pondichéry (Edm. André).

Var. *Leveillei* Buyss.

(*Rev. d'Ent. T. X.*, p. 47, 1891.)

♀ Provinces Centrales (R. C. Wroughton).

Troisième tribu, PARNOPINÆ, Aaron.

Cette tribu ne comprend qu'un seul genre. Les mâchoires et la languette de la bouche de ces insectes étant très allongées forment une sorte de trompe qui, au repos, reste appliquée contre la poitrine. L'abdomen est composé de trois segments visibles chez la femelle et de quatre chez le mâle.

Genre PARNOPES Latr (Pl. III et IV).

26. *P. viridis* Brullé.

(*Hym. IV*, p. 13, 1846) ; (*Pl. III, fig.* 13).

♀ Calcutta (ma Collection).

DESCRIPTION OF THE PLATES.

PLATE I.

1. Ongles des tarsi des *Cleptes*.
2. Thorax de *Cleptes* vu de profil :
a.—pronotum. d.—postécusson.
b.—mésopleures. e.—écusson.
c.—stigmate méta-thoracique.
3. Mâchoire de *Cleptes* avec son palpe sous-maxillaire.
4. Languette de *Cleptes* avec ses palpes labiaux.
5. *Cleptes*.
6. Métathorax de *Notozus* vu de profil :
c.—stigmate méta-thoracique.
d.—postécusson.
e.—écusson.
7. Ongle des tarsi d' *Ellampus auratus* L.
8. Languette d' *Holopyga* avec ses palpes labiaux.
9. Mâchoire d' *Ellampus* avec son palpe.
10. Méta-thorax d' *Ellampus* :
c.—stigmate méta-thoracique.
d.—postécusson.
e.—écusson.
11. *Ellampus auratus* L.
12. *Holopyga indica* Mocs.
13. Aile antérieure d' *Holopyga*.
14. Aile postérieure d' *Holopyga*.

PLATE II.

1. Ongle des tarsi des *Hedychridium*.
2. " " " *Hedychrum*.
3. Languette et palpes labiaux d'un *Hedychrum*.
4. Mâchoire et son palpe d'un *Hedychrum*.
5. Troisième segment abdominal vu de profil de l' *Hedychridium*
Wroughtoni Buyss.

6. *Hedychridium Wroughtoni* Buyss., ♀.
7. Troisième segment abdominal, vu de profil, de l' *Hedychrium flammulatum* Sm.
8. Ongle des tarses du *Chrysogona assimilis* Dahlb.
9. Aile antérieure du même.
10. *Chrysogona assimilis* Dahlb. ♀
11. Troisième segment abdominal, vu de profil, de la *Spinolia magnifica* Dahlb., ♂.
12. Aile antérieure de *Spinolia*.
13. Troisième segment abdominal, vu de profil, de l' *Euchraus purpuratus* F., ♂.
14. Mâchoire et son palpe de la *Chrysis ignita* L.
15. Languette et palpes labiaux de la *Chrysis bayadera* Buyss.
16. Ongle des tarses des *Chrysis*.

PLATE III.

1. *Chrysis bayadera* Buyss.
2. *Chrysis Wroughtoni* Buyss.
3. Troisième segment abdominal, vu de face, de la *Chrysis bayadera* Buyss.
4. id id de la *C. speculata* Buyss.
5. id id „ *C. oblitterata* Moes.
6. id id „ *C. libita* Buyss.
7. Fouet d'une antenne de la *C. shangaiensis* Sm.
8. Base du fouet d'une antenne de la *C. oculata* F.
9. Tête de *Stilbum*, vue de face.
10. Postécusson d'un *Stilbum*, vu de profil.
11. Troisième segment abdominal, vu de profil, du *Stilbum splendidum* F.
12. *Stilbum splendidum* F.
13. *Parnopes viridis* Brullé.

PLATE IV.

1. Aile inférieure de *Stilbum*.
2. Aile supérieure de *Stilbum*.
3. Languette et palpes labiaux de *Stilbum*.
4. Mâchoire et son palpe de *Stilbum*.

5. Aile supérieure de *Parnopes*.
6. Tarse antérieure de *Parnopes*.
7. Bouche de *Parnopes* vue de profil.
8. Mâchoire et son palpe de *Parnopes*.
9. Palpe labial de deux articles.
10. Palpe sous-maxillaire d'un article.
11. Postécusson vu de profil de la *Parnopes viridis* Brullé.

PLATE V.

1. *Cleptes*.
2. *Ellampus auratus* L.
3. *Holopyga indica* Mocs.
4. *Hedychridium Wroughtoni* Buyss., ♀.
5. *Chrysogona assimilis* Dahib., ♀.
6. *Chrysis bayadera* Buyss.
7. *Chrysis Wroughtoni* Buyss.
8. *Stilbum splendidum* Fab.
9. *Parnopes viridis* Brullé.

THE POISONOUS PLANTS OF BOMBAY.

BY SURGEON-MAJOR E. R. KERTIKAR, L.M.S., F.L.S.,

CIVIL SURGEON, THANA.

PART XV.

(With Plate Q.)

(Continued from Vol. X, page 279.)

CORALLOCARPUS EPIGÆA.—Hook. *fl. in Gen. Pl.* I, 831.

Natural Order—CUCURBITACEÆ.

MARATHI—कव्वी तरे.

This is a small herbaceous annual climbing plant throwing out foliage in the early part of the rainy season, flowering between July and September; and maturing into seed in the cold weather.

ROOT.—Very large; said to be turnip-shaped, but oftener irregular.

STEM.—Roundish; rather succulent, prostrate glabrous; glaucous (Trimen). Seldom as thick as a quill; jointed; often bending at right-angles at the joint, or "hexacoe" as Wight calls it.*

TENDRILS.—Simple; in the older branches very much branched; distinctly lateral.

LEAVES.—Rather small; 1-1½ inches long; retunate; very cordate, sometimes, at the base; more or less 3-5 lobed. Lobes obtuse or acute; irregularly and slightly dentate. They are "rounded," says Wight; the lateral ones the broadest and slightly 2-lobed. Both the surfaces of the leaf are rather thick or fleshy; and shortly or roughly pubescent. Wight says the leaves are "sometimes only ob-arsely angled, densely covered on both sides with short bristly hairs." This is something more than being "pubescent" as described by Trimem. Wight's description is more accurate as regards the Indian species.

PERICLÆA.—More than half the length of the leaf; stout, glabrous; and somewhat rigid. It is often so bent as to give the leaf a deflexed appearance.

* Icones, Vol. II, p. 7. Pl. 503/1979, 1842.



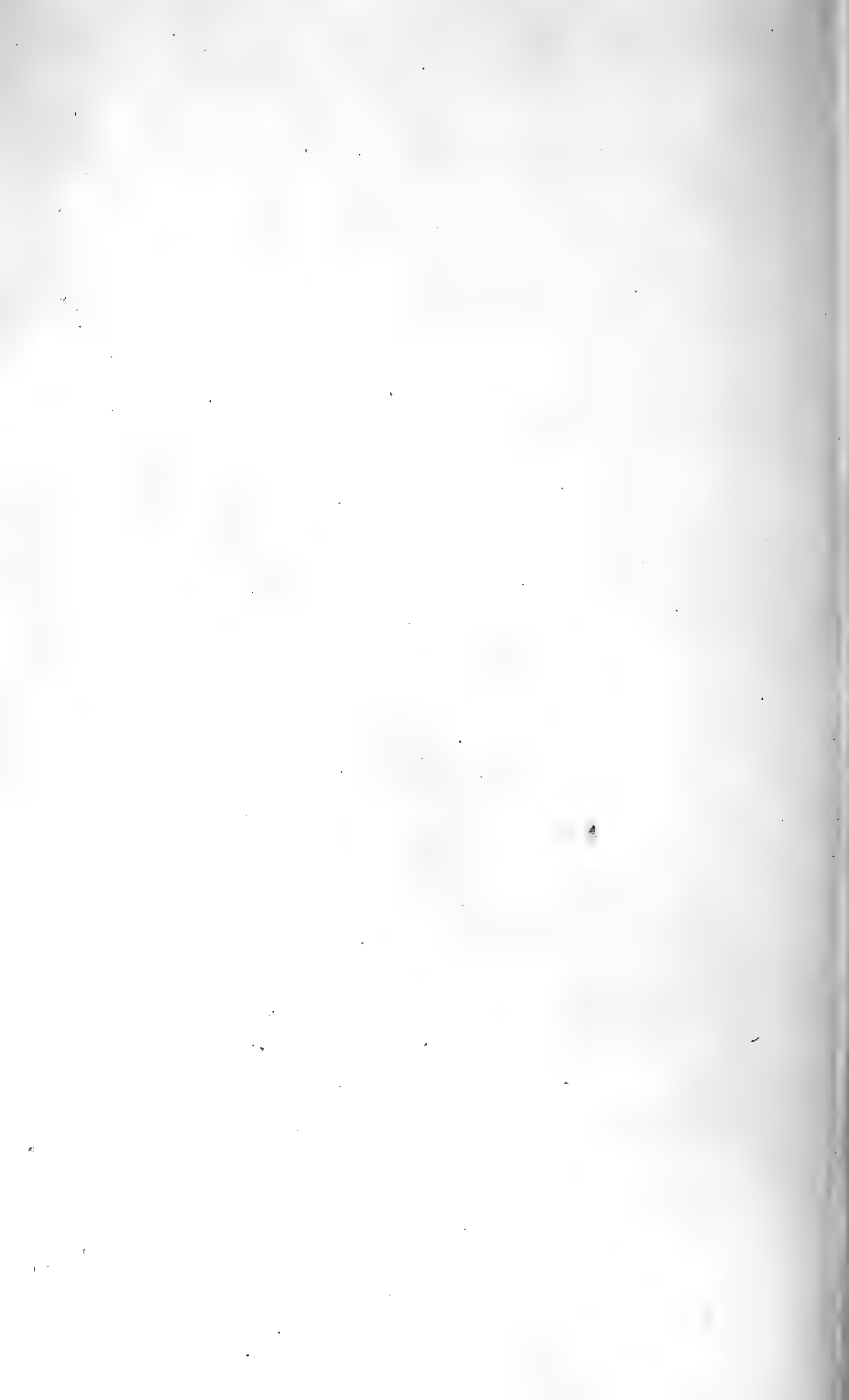
Wm. Benjamin del.

Wm. B. Esch. Chrom. lith. London.

THE POISONOUS PLANTS OF BOMBAY.

Corchorus epigaeus Nat. Ord. Cistaceae.

A The plant B The female flower enlarged C The fruit enlarged D The fruit enlarged



FLOWERS.—Unisexual; monœcious. Yellowish-green, appearing between June and September.

MALE FLOWERS.—Very small. Shortly racemose at the apex of a long thickish peduncle, on short pedicels; decidedly more yellow than the female flowers. They are at times solitary.

INFLORESCENCE.—A Raceme. "A small corymb at the apex of a long peduncle," says C. B. Clarke.* This is a more accurate description.

PEDUNCLE.—Roundish, smooth, straight, stiff; having the flowers nearly all crowded at the apex; length $1\frac{1}{2}$ - $2\frac{1}{2}$ inches. Clarke says it is $1\frac{1}{2}$ -2 inches. From the plants I have been able to examine, I may say that the length is not more than an inch at the utmost.

BRACTEOLAS.—Present at the insertion of the pedicels.

PEDICELS.—Short; " $\frac{1}{4}$ - $\frac{1}{2}$ inch or sometimes 1 inch" (Clarke).

CALYX.—Campanulate (Wight); lobes, 5, short.

COROLLA.—5-partite. The calyx-lobes are "undivided," says Arnott.† But this would be considered due to insufficient development.

STAMENS :—

FILAMENTS 5 (arranged 2 + 2 + 1), *i. e.*, two sets of stamens united forming a bundle, each of two filaments; and one solitary; nearly sessile; at the mouth of the Calyx-tube.

CONNECTIVE.—Very small.

ANTHERS.—Free; 1-celled. Arnott says† that the anther-cells are "straight, oblong, lateral on their thin connective which is *not produced*." There is no rudimentary gynœcium in the male flower‡ (Baillon). This may be considered as a prevailing characteristic of this genus.

FEMALE FLOWERS.—Axillary; solitary; in the same or different axils from those of the male flower (Wight): or "accompanied with a male raceme" (Trimen). Larger than the male; more greenish than yellow. Sometimes the female flower arises from the axil of the tendril.

PEDUNCLE short.

CALYX. }
COROLLA. } as in the male.

OVARY.—Inferior; ovoid; of three carpels united into one cell.

* Hooker's Flora of British India, Vol. II, p. 268.

† *Vide* Hooker's Journal of Botany, Vol. III, 1341.

‡ History of Plants, Vol. VIII, p. 402.

OVULES.—From 6 to 9 in number ; horizontal.

PLACENTA.—Absent.

STIGMAS.—3.

STYLES.—3, distinct but very short.

FRUIT.— $\frac{3}{8}$ inch, often $\frac{1}{2}$ to $\frac{3}{4}$ inch ; roundish or ovoid ; conical, says Trimen * with a blunt beak which is hardly perceptible in most female flowers. The fruit is smooth. Its colour varies from orange to brick-red, which is most marked between the two ends—i.e., in the mid-portion, bearing four or five vertical mottled-whitish streaks. The top of the fruit is greenish. Botanically, the Fruit is an “*Inferior Berry*.” But of this more hereafter, under the head of *Remarks*.

SEEDS.—Elliptical or nearly globose ; little-margined, about 6 in number ; much longer than broad (Clarke). Trimen says the seeds are “about 9, in an orange-coloured pulp,” very slightly compressed ; pale brown ; “adpressed-pilose.” Wight on the other hand says that the seeds are white. In the specimens I have examined, the pulp is distinctly whitish and gelatinous. The colour of the seed varies from white to brown. The older or maturer the seed the browner is the colour. Wight and Arnott in their *Prodromus* (Vol. I. p. 346), say the seeds have slightly “compressed sides.”

ALBUMEN.—Absent.

REMARKS.

The following is a list of the various synonyms of the plant suggested by authoritative Botanists from time to time.

1. *Corallocarpus epigæus*, Trimen's Handbook of the Flora of Ceylon, Vol. II, p. 258, 1894.
2. *Bryonia epigæa*, Blume, Bijdr. 925=*Methria Ramphiana*.
3. *Bryonia epigæa*, Rottl. in ges. Naturf. Freunde, Neue Schr. IV (1803), 223.
4. *Bryonia epigæa*, W. & A. Prodromus, Vol. I, p. 346.
5. *Bryonia epigæa*, Willd., Sp. Pl. IV, 619.
6. *Bryonia glabra*, Roxb. Hort. Beng. 104, and Flora. Br. Ind. III, 725.
7. *Bryonia palmata*, Wallich's Cat., No. 6711 (D).
8. *Bryonia sinuata*, Wall. Cat., No. 6711 (D), and Bentham and Hooker's Gen., Pl. I, 831.

* Hand Book of the Flora of Ceylon, Vol. II, p. 258, 1894.

9. *Echmandra epigæa*, Arnott. (Vide Hooker's Journal of Botany, Vol. III, pp. 271-274, 1841.)
10. *Echmandra epigæa*, Wight's Icones. t. 503.
11. *Echmandra epigæa*, Dalzell and Gibson's Bombay Flora, p. 100.

Such is the formidable array of the synonyms.

Following Hooker *fil.*, I have named the plant I am describing *Corallocarpus epigæa* instead of the more correct modern combination *Corallocarpus epigæus* used in the "New Index," and by Trimen in his recent Flora of Ceylon. Unfortunately our botanical nomenclature has not as yet reached that state of grammatical purity which should absolutely discard the combination of a generic name with a masculine termination and a specific name with a female termination, or *vice versâ*. In naming the plant I am describing, I have adopted the terminology as given in our standard work on Indian Botany, namely, Hooker's Flora of British India, without attempting to question its grammatic propriety; and I did so long before Trimen's Flora of Ceylon or the New Index had made its appearance. Dr. Dymock in his "Pharmacographia Indica" adopts it, and I have adopted it accordingly.

Dr. G. A. Walker-Arnott, in his very valuable contribution to Hooker's Journal of Botany in 1841, cited above, was the first among Indian Botanists to acknowledge Schrader's attempt to subdivide the *Cucurbitaceæ*, in anything like a scientific way. Schrader's arrangement, then new, was published in the "Linnæa," XII, p. 401. The stigma in *Bryonia scabra* (var. E. M.) has the style trifid, and, says Arnott, "the stigma precisely as in *Bryonia dioica*." I have already observed that "the connective is small." Arnott observes the connective in the species belonging to the genus *Dryonia* is "sinuated and lobed," and that the anther-cells are placed on the back margin of the connective. Arnott, moreover, observes that the style in genus *Bryonia* is "surrounded at the base with a thick, annular, fleshy, usually lobed, disk." Following Hooker (C. B. Clarke's Article, cited above, in "Flor. Br. Ind."), and, judging from my own experience, I have said that the disk is absolutely absent.

Historically, the formation of the genus *Echmandra*, of which the plant I am describing formed a species under the name of *Echmandra epigæa*, was the result of the classification originally suggested by

Schroder. Whether we know the plant as belonging to the genus *Echmandra* or to the genus *Bryonia*, one thing is certain, that *Corallocarpus epigæa* is of the same genus as the English *Bryonia dioica*. C. B. Clarke completely drops the genus *Echmandra* from his classification of the *Cucurbitaceæ* in Hooker's Flora of British India.

The fruit of the plant I am describing is ordinarily termed a "Berry," but this term I have not adopted above in my description without modification. The term *berry* is a puzzling term in botany. It is easy enough to understand what a "berry" is in popular parlance; but in botany the term *berry* is used by several eminent Botanists with such varied significations that it would be better if the term were entirely obliterated from the Scientific Botanical Vocabulary, for more than one reason. It conveys no accurate idea as to whether the fruit is *superior* or *inferior*. It gives no idea whether the fruit is pulpy inside or has a hard stony seed. It gives no idea as to whether the fruit contains one seed or more than one. To shew to the general reader of botany how many descriptions can be given from various authoritative writers, of one single term, having a sort of mixed position in popular parlance and in botanic nomenclature, I crave the indulgence of the editor of this journal to embody in the following few pages, quotations from various Botanists of eminence. I crave the same indulgence of the reader of this journal, and trust that I may not be charged with a vain-glorious desire to parade my reading in botany, but that I may be credited with a sincere desire to expose the grievance of the systematic student of scientific botany that our botanical technical terms are sometimes extremely puzzling.

Sir Joseph Hooker's definition (p. *xx*. "Outlines of Botany," Vol. I, 175; "Flor. Br. Ind.") of the term "Berry," is as follows: "It is a succulent (indehiscent) fruit," in which the whole substance of the pericarp is fleshy or pulpy, with the exception of the outer skin or rind, called the *epicarp*. The seeds themselves are usually immersed in the pulp; but in some berries the seeds are separated from the pulp by the walls of the cavity or cells of the ovary, which form, as it were, a thin inner skin or rind called *Endocarp*. It is not mentioned here whether the fruit is *superior* or *inferior*.

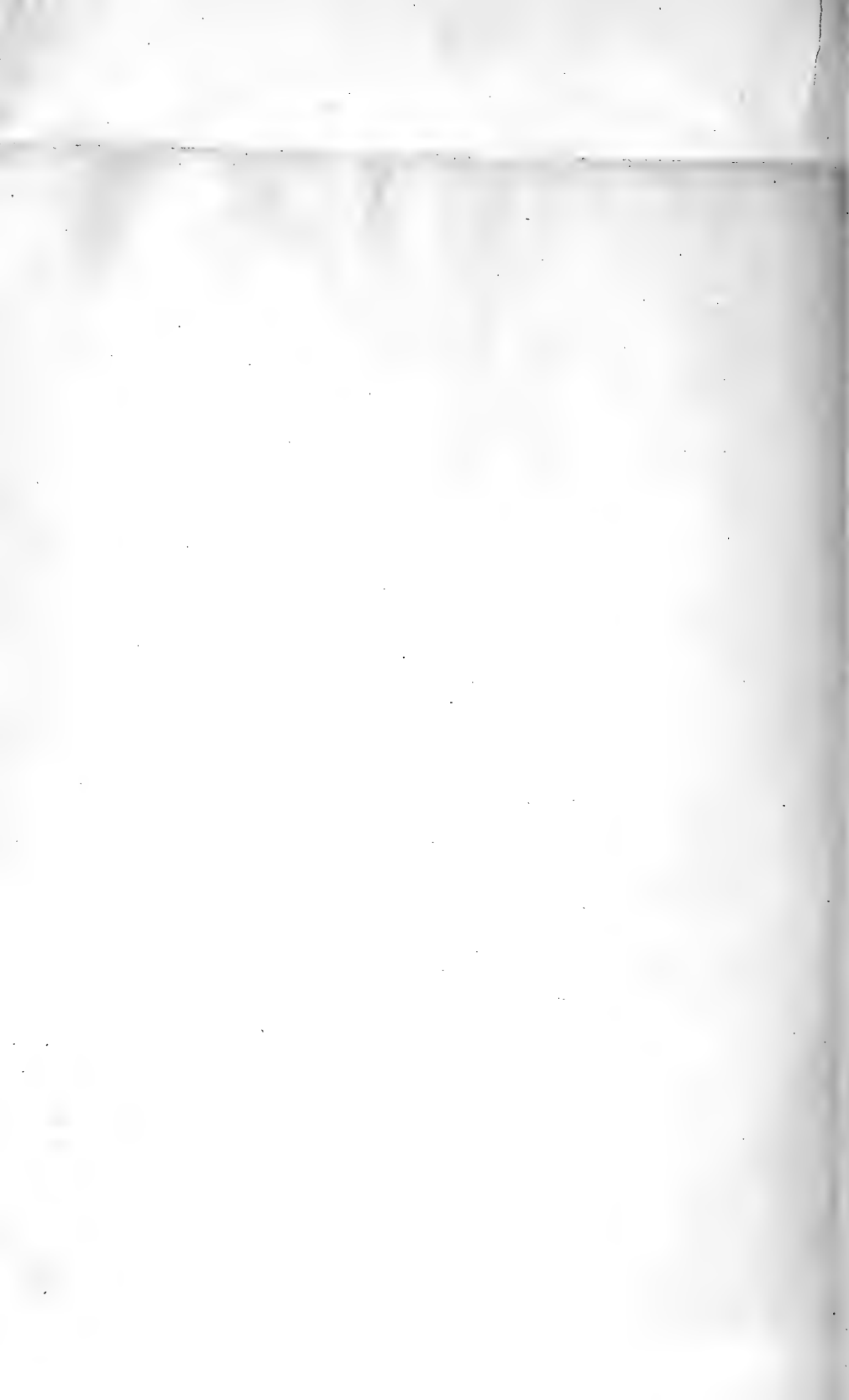
In Lindley's "Glossary of Technical Terms" (see page *xii*), the following is the description of a Berry:—*Berry* or *Bacca*, "that is to

SCORPIONS.

Mr. Pocock, of the British Museum, having kindly undertaken to identify (and, if necessary, name and describe) any scorpions sent to him, I have undertaken, on behalf of the Bombay Natural History Society, to "engineer" a scorpion survey of India. The great desideratum, of course, is to obtain long series of specimens of each species with accurate "localities." In the matter of "wild" scorpions, *i.e.*, those found under stones, &c., in forest and field, I have had no difficulty in making arrangements. They are easily obtainable in large quantities, and numbers of members of the Society and friends all over India have promised to make and send in collections. But there are a number of species (mostly small and slender with long tails) which, though common enough, can never be found more than one at a time, and then generally in houses, and I wish to appeal, through the medium of the journal, for specimens of such. They may be sent either alive or in spirits to the rooms of the Natural History Society, 6, Apollo Street, Bombay. It may be useful to add that the most vicious scorpion may be caught without danger with a noose in a piece of twine to be slipped over its tail and drawn fairly tight.

R. C. WROUGHTON.

BOMBAY, *July*, 1896.



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LAND AND FRESHWATER SHELLS.

The collection of land and freshwater shells in the Society's Museum is very incomplete and badly requires working up. Members are requested to send in specimens, either alive in damp grass or the shells. The animals can easily be withdrawn from the shells if killed by dipping them in boiling water. The opercula of the operculates should be preserved and placed in the aperture with a little cotton wool. Localities and heights above the sea-level should also be noted.

Lieutenant A. J. Peile, R.A., who has already given the Society many specimens and much assistance with the marine shells, has kindly undertaken to help to name and classify the land and freshwater shells.

Specimens should be addressed to

The Honorary Secretary, Bombay Natural History Society.

September, 1896.



say, a succulent seed-vessel, filled with pulp, in which the seeds nestle, as in *Solanum*." In a companion work of Lindley's entitled "Elements of Botany" (page 107, 1847), a *Berry* is "a succulent fruit, the seeds of which lose their adhesion when ripe, and lie loose in pulp; *ex.*, a gooseberry." There is the same omission here as in Hooker, as to whether the fruit is *superior* or *inferior*.

Professor J. H. Balfour of Edinburgh includes the Berry (*bacca*) among the Indehiscent Syncarpous fruits, and describes it as follows:—"A *Berry* or *Bacca* is the name given to all indehiscent Syncarpous fruits, the seeds of which are immersed in a pulpy or fleshy mass. Such fruits are collectively called *baccate* or *berried*. In the true berry, such as the Gooseberry or Currant, the calyx adheres to the fruit, and the placentas are parietal; while in the Grape (*Uva*) the ovary alone is present, and the placentas are central. Instances of *baccate* fruits are seen in Solanaceous plants, such as the Potato, Egg-plant, Mandrake, Belladonna, and Winter-cherry, as well as the Mistletoe." (P. 287, Class Book of Botany, 3rd Edition, 1870, Edinburgh.) Note that the superior or inferior nature of the ovary is not alluded to here.

In Henfrey's "Elementary Course of Botany" (4th edition by Maxwell T. Masters and A. W. Bennett, p. 147, 1884), the following is the description of the "*Bacca* or *Berry*":—"The *Bacca*, or true berry, is an inferior succulent fruit, crowned by the withered teeth of the calyx; it is uniformly pulpy, with a thin skin, the numerous seeds being imbedded in the pulp, as in the gooseberry and currant, &c. The term *Baccate* is, however, now generally applied to all succulent fruits, whether *superior* or *inferior*, which have not a distinct stone-like drupe." Here, there is greater accuracy.

In Professor Bentley's "Manual of Botany" (4th edition, 1882, pp. 311 and 312), the term is thus described:—"The *Bacca* or *Berry* is an inferior syncarpous fruit, with a fleshy indehiscent pericarp, one or more-celled, many-seeded, pulpy. The pulp is produced from the placentas, which are parietal and have the seeds at first attached to them; but these become alternately separated and lie loose in the pulp. Examples may be found in the gooseberry and currant."

* * * "The name *baccate* or *berried* is applied by many Botanists to any fruit of a pulpy nature."

Remember, as observed by Bentley, that the fruit styled by him "Pepo," which is an "inferior, one-celled, many-seeded, fleshy or pulpy fruit," has seeds which are "attached to parietal placentas," and "imbedded in pulp, but *they never* become loose, as in the case of the berry."

In the Manual of Botany, just published by Professor J. Reynolds Green, F.R.S., D.Sc., F.L.S., of the Pharmaceutical Society of Great Britain (*Vol. I, June, 1895*), and based upon the Manual of the late Professor Bentley, just referred to, Professor Bentley's classification seems to be considerably altered as regards terminology. The "berry" accordingly is described as one of the "*true indehiscent, monocarpellary fruits*." Professor Reynolds Green, in further detailing the characteristics of the fruit termed "Berry," observes as follows* :—"Though the berry is usually formed from a syncarpous ovary, there is one form of it which may be included here. It is a succulent fruit with a single cell in which is a single seed. This is hard and stony, and, at first sight, may be taken to be the same thing as the stone of the plum. It is not so, however, as the latter is hollow and encloses the seed. In the stone is the seed. This form of fruit is seen in the date and some other palms." Thus, according to Professor Reynolds Green, no fruit of the Cucurbitaceous order can be classed under the term "Berry," as it is not *monocarpellary*, but *tricarpe*llary. Note that in Hooker's "Flora of British India," Clarke, our Immediate Past President of the Linnæan Society, who writes the article on the *N. O. Cucurbitaceæ*, distinctly says that the fruit of *Corallocarpus epigæa* is a "Berry." The difficulty to me is, as it doubtless would be to Mr. Clarke himself when reading this new description of Professor Reynolds Green's, that the *Berry* is now classified by the latter as a *monocarpellary* fruit—meaning that it is made of *one carpel*. I do not think the term *monocarpellary* can be made to indicate a fruit which consists of *one cavity* formed by the union of *two or more cells*. In the *N. O. Cucurbitaceæ*, the fruit is distinctly formed by the union of three carpels, whereas *monocarpellary* would mean formed of one carpel only. Owing to this confusion of the connotation of the botanic term "Berry," as already observed, I have refrained from distinctly classifying the fruit

* P. 244, "Manual of Botany," Vol. I; Morphology and Anatomy, 1895.

of *Urallocarpus epigea* as merely a *Berry*, and have used the distinguishing expression "*Inferior Berry*" to denote that the fruit is formed from an inferior ovary. But I must distinctly discard the term *monocarpellary*, as suggested by Professor Reynolds Green, in applying it to the *tricarpellary* fruit of any member belonging to Cucurbitaceous Family.

LeMaout and DeCaisne * say that the fruit of the *N. O. Cucurbitaceae* is a "fleshy berry (rarely dry)." According to these Botanists a berry† is either "simple" or "compound." The "simple" berry is found in *Berberis* and *Arum*. It differs from the "compound" berry by originating in a "solitary carpel." * * * ‡ Further LeMaout and DeCaisne observe that the fruit termed "*Berry (bacca)*", whether simple or compound, is succulent, indehiscent, and has no stone." (*N.B.*—The italics are mine.—K. R. K.). "It differs from the capsule only in its fleshy consistence (and not in being an inferior fruit?—K. R. K.; for be it noted that the fruit of the *Cucurbitaceae* is distinctly inferior, whereas a capsule is superior.—K. R. K.). I refrain from further quoting fully, as I should like to do, the observations of LeMaout and DeCaisne for fear it would involve the ordinary reader of these pages into a fearful maze as regards the true botanical significance of the term "*Berry*," and would in no way help in deciding whether the fruit of the plant I am now describing is or is not a berry pure and simple in the ordinary acceptation of the term.

The best description of the fruit of the *Cucurbitaceae* is given by Gaertner. I shall refer to him later on.

According to Asa Gray the term "*berry*" (*bacca*) "comprises all simple fruits in which the pericarp is fleshy throughout. The grape, gooseberry, currant, cranberry, banana and tomato are familiar examples."§

This is what Professor Otto W. Thomé says regarding the nature of the *berry*: "In the *berry* all the layers of the pericarp are fleshy and succulent, as in the grape, currant and gooseberry; or the outer

* A General System of Botany, translated by Mrs. Hooker, 1873. p. 451.

† *Op. cit.*, p. 99.

‡ *Op. cit.*, p. 103.

§ P. 299, Botanical Text Book, Vol. I; Structural Botany, 6th Edition, 1879, New York.

layers are harder as in the citron and gourd (the latter sometimes called a *pepo*).”*

Professor Sydney H. Vines, of Oxford, gives the following description of the *berry* †:—“The endocarp is soft and juicy, as well as the mesocarp, so that the seeds are imbedded in the pericarp: there may be one seed only as in the date, or many, as in the gourd, currant and grape: the fruit may have one loculus, as in the grape and the gourd, or several loculi, as in the orange: and further it may be superior, as in the grape, orange and lemon; or inferior, as in the currant, the gooseberry and the gourd.” (The italics are mine.—K. R. K.). If this description is taken as our guide, as we should, considering that it is the best and most accurate description I have yet seen in a student’s text-book, the fruit of the plant I am now describing may be safely termed an *inferior berry*.

Professor A. Kerner von Marilaun, of the University of Vienna, in his excellent work entitled the “Natural History of Plants,” translated into English by Professor F. W. Oliver, of University College, London (Vol. II, p. 427, 1895, London), describes the *berry* as follows:—“When the seed-case derived from the pistil becomes altogether fleshy and succulent, the fruit is termed *berry*. From inferior pistils arise inferior berries. From superior pistils superior berries.” This description may be usefully read side by side with that of Professor Vines.

Gaertner in his description of the *pepo* ‡ divides the fruit into two classes:—

(1) *Solidi*, i.e., *solid*; having a single cavity. In this class he includes “*Eryonia*,” which is one of the former generic names of the plant I am now describing as *Corallocarpus epigcea*; *Cucumis*, *Cucurbita*, and *Trichosanthe* are some of the other genera included by Gaertner under this class.

(2) *Cavi*, i.e., *hollow*; under this head he includes *Momordica charantia*.

Having so far dwelt on the difficulties of the student of botany in giving an exact name to the kind of fruit seen in the plant I am

* P. 153, “Text Book of Structural and Physiological Botany,” translated by A. W. Bennett, 1877, London.

† “A Student’s Text Book of Botany,” London, 1895, p. 552.

‡ P. XCVII, Vol. I, “De Fructibus et Seminibus Plantarum” Lipsie, 1801.

describing, I now proceed to examine the indigenous literature on the subject. I must premise, however, that my knowledge of Sanskrit is very limited; but what I shall hereafter say regarding native writers is all the result of my personal study of such writers.

Corallocarpus epigæa does not appear to have been described by many of the older Sanskrit writers, as it is not found in "Rāj-Nighant"; "Mudan Pāl Nighant"; or "Bhāv-Prakāśh." It is not referred to in the *Ashtāṅg-rhidyaya* of Wāgbhat, and it is doubtful if it can be found in Charak or in Sharangdhar. The only author who describes it is Shodhal. He is referred to by Katā Bhat of Junagadh.* Katā Bhat says that Shodhal flourished after Narhar Pandit of Kāshmir, the writer of the celebrated "Rāj-Nighant." Shodhal's work is based on Dhanvantari-Nighant, although the year in which his work was written is not stated. Shodhal calls the plant I am describing *Nāhi*. This word is not to be found in Böttlingk's Wortbuch or in Burnouff's Sanskrit and French Dictionary. It is from the Sanskrit word *Nāhi* that the Marathi designation of *Nāi* is derived; the prefix *Kadavi* (which means bitter), as given by me above, merely signifying the bitter quality of the mucilaginous or gummy exudation obtained on section of the root in its fresh condition. Let me add here that Colonel Drury says that the root has a "subacid" taste.†

I cannot refrain from observing here that I am very much puzzled how it is that Dr. Dymock and his colleagues‡ have fallen into the error of making the following remark: "This plant is called in Sanskrit Chbilibinda, Pātāla-garuda, and Maha-mula or Great-root." I say that it is a mistake to say so; for I am positive that all these terms, embraced in my quotation from Dr. Dymock's "Pharmacographia Indica," are to be found in "Bhāv-Prakash" (p. 111, Jugadishwar Press edition, Bombay, 1891). These Sanskrit terms refer to a plant belonging not to the *N. O. Cucurbitaceæ*, to which belongs the plant I am describing, but to the Natural Order *Menispermaceæ*. The name of the plant implied by the Sanskrit terms of Dr. Dymock is *Cocculus villosus*—known in Marathi as *Tānichā-Vel*, i.e., the creeper called *Vant*. In the Marathi work called "Nighanta Ratnakar"§

* P. 569, Section 479, Nighant Sangrah, 1893.

† "The Useful Plants of India," London, 1873, p. 88.

‡ "Pharmacographia Indica," Vol. II, p. 90, 1891.

§ P. 123, Vol. I, Bombay Edition, 1867.

Chhilihinta or *Chhilihinti*, or *Chhilli* is *Tânichâ-Vel*. At p. 201 of the same volume *Pâtâl-garudi* is also called *Tânichâ-Vel*; similarly at p. 269 of the same volume, *Mahâmulâ* is a synonym for *Tânichâ-Vel*. No farther indigenous support is needed to establish my view that Dr. Dymock's remark is an erroneous one, especially as Shodhal's description of *Nâhi* is to my mind so complete as to make me firm in the belief that the plant he calls *Nâhi* is what we call in Bombay *Kadavi Nâi* = the *Corallocarpus epigea* of Hooker fil ("Flora Br. Ind.," Vol. II, p. 628).

I cannot venture to say how it is that Dr. Dymock and his colleagues fell into this pardonable error, but I feel bound to point it out as the result of my study regarding the plant I am describing. That Dr. Dymock has himself identified *Tân-Vel* (or as styled in Marathi *Tânichâ-Vel*, and briefly *Tân-Vel*), as a member of the *N. O. Menispermaceæ*, and not *Cucurbitaceæ*, will be amply borne out by a reference to p. 190, last line, Vol. II, of this Society's Journal, 1887, where, as synonyms for *Cocculus villosus*, DC., Brigade-Surgeon W. Dymock, in his valuable article headed *Marathi Names of Plants (with a glossary)*, gives the following Bombay names:— "वसनवेल, *Vasanvél*; पारवेल, *Pârvél*; तान, *Tân*." (The Marathi word should have been तान and not तान, which latter has no meaning in Marathi.—K. R. K.) For remember that तान is an abbreviation of *Tân-Vel* or *Tânichâ-Vel* = the creeper *Tân*.

Refer also in this connection to the then Hon'ble Mr. Justice Birdwood's "Catalogue of Matheran and Mahableshwar Plants."* Mr. Justice Birdwood's remarkably accurate knowledge of the Bombay Flora is my sole guarantee for quoting his unquestionably high authority in solving this somewhat ungracious question as against Dr. Dymock, my former Teacher of Materia Medica in the Grant Medical College, in the early seventies, and my subsequent friend and brother-officer in the Indian Medical Service. Mr. Justice Birdwood, under the *N. O. Menispermaceæ*, gives *Cocculus villosus* as the Latin equivalent of तान (*Tân*), वसनवेल *Vasan-vel* (Sanskrit *Vasadani*) &c. [Note that in Sanskrit it is not *Vasadani*, but *Vatsâdani* or *Vâsani*.†]

* P. 112, Vol. II, 1887, Bo. N. H. Society's Journal.

† Vide "Raj Nighant" of Marhar Pandit; Burnouf's Sanskrit and French Dictionary and Böttlingk's Wortbuch.

I cannot refrain from quoting here the remarks I have come across regarding the genus *Bryonia*, under which Loudon describes the species I have called in this paper *Corallocarpus epigæa*, as *Bryonia. epigæa*.* Loudon derives the generic name *Bryonia* from the Greek *Bruc* = to push or grow rapidly, in allusion to the manner of its growth. * * * "The root" (presumably of the whole genus) grows to a vast size." That it does grow to a large size, and in a very irregular manner too, I can vouch for in the plant which I am now describing, and which was in the days of Loudon known as *Bryonia epigæa*. "Gerarde says," observes Loudon, "that the Queen's Chiefe Chirurgeon, Master William Goodorous, showed me a root hereof," i.e., either of *Bryonia alba* or *B. dioica*—I am unable to ascertain which, "that waied halfe an hundred waighte, and of the bignesse of a childe of a yeere old." Loudon observes further as follows:—"To this Linnæus ascribes the quickness of its growth, though it springs late. The roots have been formerly by imposters brought into an human shape, carried about the country and shewen for mandrakes to the common people. The method which these people practised was to open a young thriving bryony plant, being careful not to disturb the lower fibres; to fix a mould such as is used by those who make plaster figures close to the root, fastening it with wire to keep it in its proper situation, and then to fill in the earth about the root, leaving it to grow to the shape of the mould, which is effected in one summer."

Young Indian collectors of the *mandrake root* so-called, beware! The delusion and deception that Loudon has described is practised in India also. Human nature is the same all the world over, whether it is for cunning men to practise delusion on credulous men, or for credulous collectors of curiosities botanical to be deluded into deception of the most unsuspected yet atrocious kind. I know of one individual at least among our young Indian Botanists who has fallen an unsuspecting victim to this trick of field collectors of botanical specimens for the mere purposes of trade.

The plant I am describing is by some native writers called *Shivalingi* to denote the peculiar appearance of the seed of the plant, ovoid, and marked with a sharp convexity on one of the sides. But according

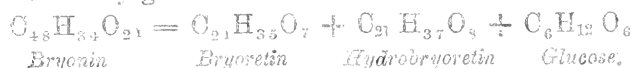
* "An Encyclopædia of Plants," London, 1829, pp. 810 and 811.

to the old Sanskrit writers I prefer to reserve this term, originally known as *Lingini* or *Lingiké* for the ground-seeking creeper bearing a much smaller fruit, in size not larger than a pea, and known in the Konkan as Kavaliché-dhole (*Bryonia laciniosa**).

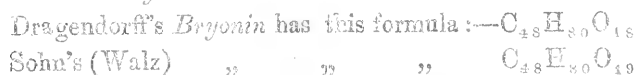
Let me observe here that Dr. Dymock and his colleagues have fallen into another slight, yet unhappy, error† regarding the interpretation of the Marathi term *Shivalingi* or *Lingini*. It is as follows:—They say that “The Marathi name signifies the *Linga* of Shiva, and is an allusion to the shape of the fruit.” Nothing of the kind. As already observed, the fruit of *Corallocarpus epigæa* is ovoid, roundish, or conical. It is the seed of *Corallocarpus epigæa* that has the shape of the *Linga* of Shiva.

POISONOUS PROPERTIES.

The observations of Dr. Dymock and his colleagues, as embodied in their “Pharmacographia Indica,” are extremely useful in understanding the active principles contained in the tuber of *Corallocarpus epigæa*. They have practically decided the question that the bitter principle contained in this plant is *Bryonin*, which Walz discovered in the European Bryony root. Dr. Dymock and his colleagues say that they have been “able to confirm this, by finding in the decomposition products two resinoid bodies, differing in their solubility in ether. *Bryonin* is a glucoside resolved by boiling with dilute sulphuric acid into glucose and two amorphous bodies, *Bryoretin*, soluble in ether, and *Hydrobryoretin*, insoluble in ether but soluble in alcohol.” The formulæ they give are as follows:—



It would be useful here to show the various formulæ given by other writers for *Bryonin*:



* See Katā Bhat's “Nighant Sangrah,” Junagadh, 1893, pp. 122 and 123; and Apte's edition of “Dhanvantari Nighant,” p. 390.

† “Pharmacographia Indica,” Vol. II, p. 91; Bombay, 1891.

Masson's *Bryonin* (in *Addenda* to Sohn's

"Dictionary of Active Principles of

Plants, 1894") has this formula ... $\text{C}_{34}\text{H}_{48}\text{O}_9$

Let it be further noted that Masson's formula

for *Bryogenin* is ... $\text{C}_{14}\text{H}_{10}\text{O}_2$

The foregoing formulæ show that the exact chemical formation of *Bryonin* is not yet a matter of chemical certainty.

To proceed further, Dr. Dymock and his colleagues say that, in addition to *Bryonin*, they have not been able "to find a second bitter principle," in the tubers of *Corallocarpus epigæa*. I must here give Dr. Dymock and his colleagues, Dr. Wardell of Calcutta and Mr. David Hooper of Ootacamund, the fullest credit for their valuable researches. They go far ahead of even a more recent collaborateur of English repute, Mr. Charles E. Sohn, F.I.C., F.C.S.* Mr. Sohn merely rests content with an observation under the head of *Bryonin*, that it is a glucoside; amorphous; very bitter; yields sugar and *Bryonetin*" (*N.B.—No formula is given for this.—E.R.K.*); that "*Bryonin* is soluble in water, alcohol (2 to 3 parts) and insoluble in ether;" and that its precipitants are Tannic acid and Plantinum Chloride." In his *Addenda* Mr. Sohn notes that both *Bryonin*, and *Bryogenin*, as formulated by Masson, are both *dextro-rotatory*; that *Bryogenin* (which, be it noted, is a *glucoside*.—K. R. K.) dissolves with red colour in concentrated Sulphuric acid, "the solution becoming purple on heating, and giving, on subsequent addition of water, a purple precipitate."

That *Bryonin* is precipitated by Tannic acid was pointed out by Professor Dragendorff of Dorpat (Russia)† on the authority of Continental and American investigators. His formula for *Bryonin* is $\text{C}_{48}\text{H}_{80}\text{O}_{18}$ as noted above.

It may be useful to quote here, *in extenso*, a brief note I have come across in Vol. XXI of the "Pharmaceutical Journal," London, (1890-91, p. 496), headed "Constituents of the Root of *Bryonia dioica*," and embodying, as I may venture to say, the most recent Continental addition to the literature on the active principle of the entire genus known as *Bryonia*. The note runs as follows:—"A treatise on this subject has been published at Dorpat by A. Mankowsky. He states

* Vide Sohn's "Dictionary of the Principles of Plants, etc.," column 1, p. 23, 1894, London.

† "Plant Analysis," translated from the German by Henry G. Greenish, F.I.O., London, 1884, p. 170.

therein that of the two glucosides contained in *Bryonia alba*, *Bryonia* and *Bryonidin*, the former is entirely without action, while the latter is poisonous only in large doses. The substances, hitherto known as *Bryonia* and regarded as the active agent of *Radic bryonice*, are simply more or less purified extracts of the root, and probably contain both glucosides. The *Bryonia* of Schwerdtfeger is a mixture of the two glucosides, with the other substances, while Wala's *bryonia* is probably a mixture of this glucoside, with *bryonidin* in smaller quantities. Introduced into the stomach, *bryonidin* causes inflammation of the stomach and larger intestines; introduced into the veins, only slight inflammation of the latter. The pancreatic juice decomposes *bryonidin*, and renders it inoperative." *Bryonidin* "has no effect on the peristaltic action of the intestines, nor on the activity of the heart, nor on the peripheral nerves; introduced into living organs, it causes an enlargement of the vessels."

If any testimony were needed to establish the poisonous properties of the plant I am describing, the quotations I have cited above will be ample. Brigade-Surgeon Lyon was quite justified in drawing attention to *Corallocarpus epigæa* in his standard work on Medical Jurisprudence (*vide* p. 201, Edition 1889) while dwelling on the poisonous properties of some of the members of the *Cucurbitaceus Family*. Dr. Lyon says that the root of *Corallocarpus epigæa* contains a bitter yellow principle which Dr. Dymock suggests may possibly prove identical with *bryenin*. This Dr. Dymock and his colleagues have established in their subsequent researches and these I have quoted above. Sowerby and the Johnsons, in the second edition of their *British Poisonous Plants* (London, 1861, pp. 16-17), have very largely dwelt on the poisonous properties of the "Red-berried, common or white-bryony,"—an English congener of the plant I am describing, and the only poisonous representative belonging to the *Cucurbitaceæ* found among the British wild plants. Sowerby observes that "the large fleshy pale-coloured root is often seen suspended in herb-shops, occasionally trimmed into a human form." Remember my warning words in a foregoing page to the inexperienced Indian collectors of the mandrake root. The root, says Sowerby, is a powerful and highly irritant purgative, decoction of which is sometimes recommended by self-constituted medical advisers (of

which, in India, likewise there is an endless number.—K. R. K.), “but dangerous to patients.” Sowerby further adds that “the berries have produced vomiting when eaten by children.” Our Indian children, half-starved though they are, and always in quest of field and forest fruit, never touch the fruit of the Indian species of Bryony I am describing. The fruit literally rots and dehisces on the plant. But there is one plant belonging to the *N. O. Menispermaceæ* known as *Calumba*; and used in this country very largely and usefully too for medical purposes—the *Jateorhiza calumba* of Miers, formerly known as *Cocculus palmatus*, the commercial parcels of which, said O’Shaughnessy more than fifty years ago,* “are adulterated with *Bryony dyed with turmeric*.” It is but natural that, when *Calumba* is so adulterated and sold in Indian bazaars, guileless and needy sufferers, having recourse to the adulterated root, under the guidance of the self-constituted medical advisers spoken of by Sowerby, should suffer from symptoms of violent vomiting and diarrhoea. No medical man prescribing *Calumba* ever anticipates such results. I have prescribed *Calumba* as a powerful tonic in dyspepsia, and as an alterative, especially in skin affections due to deficient action of the skin, but I have hitherto not had the experience of seeing any of my patients suffer from the effects of violent vomiting and diarrhoea when undergoing a course of *Calumba* treatment at my hands; for, knowing full well that the druggist and the herbalist often adulterate the *Calumba* root with turmeric-dyed roots of the Indian species of Bryony, I have always taken the precaution of selecting the proper root. The root of *Calumba* is “perforated in the centre,” says O’Shaughnessy, and “is met in slices of one or two inches diameter half-an-inch thick, much wrinkled, greyish externally, bright yellow within.” It is not at all difficult for a careful observer to differentiate from the slices of the true *Calumba* root, slices of the Bryony root, dyed with turmeric. Even although in size—i.e., in diameter and thickness—the slices of the root of Bryony may exactly correspond with those of the *Calumba* root, note that the Bryony root has not the central perforations spoken of by O’Shaughnessy as existing in the *Calumba* root; then again the external coat of the Bryony root

* Vide p. 196, Bengal Dispensatory, Calcutta, 1841.

is yellow, having been tinged with the colour of turmeric, while it is greyish in the real *Calumba* root.

The reader will ask "why this digression?" "You are speaking of the poisonous properties of the Bryony root; what have you to do with the *Calumba* root?" My answer is simple. I have already said, on high authority, that the root of *Calumba* is adulterated with turmeric-dyed bryony-root; I have also referred to my own experience that the true *Calumba* root never produces vomiting or diarrhoea. But on referring to the article on the *Calumba* root in Dr. Dymock's "Pharmacographia Indica,"* I find very much to my astonishment that the experiments therein referred to as having been made by M. Houdé (Repertoire, March, 1886, p. 113) and as resulting in M. Houdé's being able to separate a *crystalline principle, energetically productive of diarrhoea and vomiting* (N.B.—The italics are mine—K.R.K.), are puzzling unless it be supposed that the *Calumba* root was examined in an adulterated form. Because on the authority of Charles E. Sohn,† I am able to say that the two active principles hitherto found in the *Calumba* root—i.e., *Calumbin* and *Calumbic acid*—are amorphous. It is only "from acetic acid," says Sohn, that *Calumbin* "crystallizes in prisms." He attributes no poisonous properties to it, such as noted by Houté. Houté's specimen, as analysed by him, must therefore be considered to be an adulterated one. It certainly could not have been adulterated with the root of any of the *Bryonias*, as their active principles are glucosides, and none of them crystallized. It is possible some other tubercous root yielding a poisonous crystalline principle was adulterated with it, or sold in the market in the place of the true root of *Calumba*. The "*tricks of trade*" are unending.

The *Calumba* root is such an invaluable tonic that any adulteration of its root, with roots of a poisonous kind, likely to destroy its high medicinal value as a perfectly harmless tonic, and tending to credit it with not only *purgative* but even *emetic* properties, either of which properties as a matter of fact do not exist in it, should be jealously guarded. This I have ventured to do as a side-issue of this paper; for I knew, and O'Shaughnessy supports me in my experience, that the

* Vol. I, p. 47, Bombay, 1890.

† P. 24, Edition 1894, London. "Dictionary of Active Principles of Plants," &c. See also page 116 where *Calumbin* is said to be "Amorphous" in column 4.

Calumba root, unadulterated, seldom if ever occasions any unpleasant sensation in the stomach or alimentary canal, but *when adulterated* with the turmeric-dyed root of *Bryony*, it is, not unoften, administered, though unknowingly, with fatal results. Such has been my painful experience.

Remember here that *Bryoidin* referred to by Professor Dragendorff under head "*Fixed oils, &c.*" (Plant Analysis—English Translation by Greenish, p. 109), has no connection whatsoever with the active principle of the *Bryony* root. For according to the researches of Professor Flückiger, *Bryoidin* constitutes one of the remarkable series of the *Elemi* constituents. "It is a crystallizable substance, occurring in that resin, only in small quantities." Be it noted further that this organic substance known as *Elemi* is "a concrete resinous exudation, the botanical source of which is still undetermined but sometimes referred to *Canarium commune* (or to *Icica alba*), Manilla."*

It may be useful at this stage to quote the other authoritative English writers who have expressed themselves on the poisonous nature of the *Bryony* root.

London has observed that the root of the genus *Bryonia* "is a famous hydragogue, and highly purgative and acrid."†

Beck has noted that the administration of *Bryony* root "has caused vomiting, purging, fainting, violent pain, and profuse alvine evacuations."‡

James Aphjon includes the English representatives of the genus *Bryonia* (*alba* and *dioica*) among plants "which yield the more important vegetable acids."§ The acrid virtues of *Bryony*, says he, "reside in a principle soluble in water which was discovered not long since by Brandes and Firmhaber, and which they have named *Bryonine*. There are upon record some cases in which decoctions of the *Bryony* produced death with hypercatharsis." It may be stated here that the root of the Indian congener I am describing is capable of doing it.

* Lauder Brunton's Pharmacology, &c., Edition 1885, London, p. 816.

† Encyclopædia of Plants, 1829, p. 811.

‡ Medical Jurisprudence, p. 829, 3th Ed., London, 1836.

§ Vide Article "Toxicology," Vol. IV, p. 219, Cyclopædia of Practical Medicine by Drs. Forbes, Tweedie and Conolly, London, 1835.

Dr. Alfred S. Taylor, the sheet-anchor of modern Forensic talent, says that the powdered root of *Bryony*, black or white (note that with the black-*bryony* we are not concerned at present—K. R. K.) when swallowed produces severe pain, vomiting and purging, and after death the stomach and intestines are found highly inflamed.*

It is somewhat disappointing to find that in his excellent "Elements of Pharmacology," Professor Oswald Schmiedeberg, of the University of Strasburg, has made no allusion to the active principle of *Bryony*.

Baillon † makes the following remarks regarding *Bryony* :—"In our common *Bryony* (*Bryonia dioica*) the subterranean portion—white, poisonous, caustic—is extremely irritating to the skin and mucous membrane. It is a powerful, dangerous purgative, prescribed chiefly in dropsical and various nervous affections. Freed from its irritant principles, this portion is rich in starch which has been turned to account, and from which alcohol is distilled."

The testimony of Colonel Drury ‡ with regard to the Indian representative of the genus *Bryony*—namely, *Corallocarpus epigæa*, or *Bryonia epigæa* as he describes it, is absolutely worthless. His remarks show that his information is only second-hand and as such not of much value.

The English *Bryonia dioica*, says Lauder Brunton, § "is made into a tincture (bitter principle *bryonin*) the chief use of which is that of a *hydragogue cathartic*," but he adds "it is now superseded by Jalap," which latter I may say is certainly safer and less irritating to the *primæ viæ*.

Here is Sir Robert Christison's testimony regarding the poisonous nature of the entire genus *Bryony* : || "Before *Bryony* root was expelled from medical practice, it was often known to produce violent vomiting, tormina, profuse watery evacuations and fainting. Pyl mentions a fatal case of poisoning with it which happened at Cambray in France. The subject was a man who took two glasses of an infusion of the root to cure ague, and was soon seized with violent tormina

* Alfred S. Taylor on Poisons, page 519, 1846.

† History of Plants, p. 421, Vol. VIII, London, 1838.

‡ The Useful Plants of India, 2nd Edition, 1873, p. 88.

§ Pharmacology, &c., Ed. 1885, London, p. 643.

|| P. 591, Edinburgh, 1845. A Treatise on Poisons.

and purging, which nothing could arrest, and which terminated fatally (*Neues Magazin*, I. 3, p. 551). Orfila quotes a similar case from the *Gazette de Santé* which proved fatal within four hours in consequence of a strong decoction of an ounce of the root having been administered partly by the mouth and partly in a clyster to repel the secretion of milk. (*Toxicol Gén.*, I, 680.)"

Let this unquestionable testimony of Orfila, quoted as it is by such an equally unquestionable authority as Sir Robert Christison, be a warning to those who delight to call themselves the admirers and followers of *Homœopathy*. I have recently come across a writer on the "*Homœopathic use of Plants*"—Richard Hughes, L.R.C.P., Ed.—who, in an elaborate volume entitled *A Manual of Pharmacodynamics* (5th Ed., Lond., 1886, p. 324), makes the following remarks regarding the action of *Bryonia* on the *mammary glands*:—"Whenever from the first coming in of the milk, from catching cold while nursing, or from abrupt weaning, the breast becomes swollen, tender, knotty, and painful, *Bryonia* will almost certainly resolve the inflammation and prevent the formation of abscess. Dr. Durham advises it in milk-fever." As against this homœopathic preaching, compare the testimony of our leading Allopathic Physician, Sir Robert Christison's reference to Orfila's experience, as cited above, that the administration of the *Bryony* root, partly by mouth and partly by clyster, "*to repel the secretion of milk,*" has been followed by fatal results. So much for the glory of *homœopathy* and its admirers!

Having so far dwelt on the European writers describing the poisonous properties of the genus *Bryony*, I may briefly state what Indian writers have said regarding them.

Dr. Edulji Cowasji Appu (Tukina), L. M. and S., of the Bombay University, says emphatically, in describing the properties of the genus *Bryony*, that its root contains "a peculiar bitter principle named *Bryonin*, which in non-medicinal doses is highly poisonous, acting as a violent emetic and cathartic, giving rise to symptoms resembling those of cholera."* I can safely vouch for this statement.

Shodhal, an old Sanskrit writer, has distinctly noted that plant is *hydrogogue* and *emetic*.†

* Practitioner's *Vade Mecum*, p. 126, 1891, Bombay.

† Vide Katā Bhat's *Nighant-Sangrah*, Junagadh, 1893, p. 569.

Jaikisan Indrajī says that the odour of the root is acrid, but this is a mistake. The root has no odour. It is the taste that is bitter and acrid; mucilaginous and slightly acid.

Dr. Sakbaram Arjun* and Dr. Virji Zina Ravall† dwell on its medical properties only. They both make no reference to its poisonous properties.

To sum up, whether the poisonous element is *Bryonin* as Dr. Tukina says, or whether it is *Bryonidin* which causes inflammation of the stomach and larger intestines as mentioned above in a quotation from the Pharmaceutical Journal (1890-91, p. 496), there is scarcely any doubt but that the root of the *Bryony Genus* may be safely looked upon as a powerful irritant of the entire elementary canal, causing dangerous vomiting, accompanied with fainting, and almost fatal hypercatharsis.

O'Shaughnessy states that the powder of the root of the plant I am describing, which he, according to the nomenclature of his day, calls *Bryonia epigæa*, is given by native practitioners as an aperient and alternative in chronic dysentery and venereal complaints.—(Ainslie, vol. II, p. 158). I am afraid both Ainslie and O'Shaughnessy are trusting to second hand information, else Ainslie at any rate would not have committed himself to the somewhat dangerous statement that such a dangerous irritant of the *primæviæ* could, by any possibility, be a remedy in chronic dysentery. In venereal complaints it may be a possible remedy, but on other physiological grounds, which I need not discuss here, it is by no means a safe remedy.

In concluding this notice, I may here note that the Sanskrit synonym *Kadamba* given to *Bryonia epigæa* in the Mangalore book, issued under the title "*Five Hundred Indian Plants*," ‡ is positively wrong. I can say with confidence that the Sanskrit plant known as *Kadamba* does not belong to the *N. O. Cucurbitaceæ*, but to the *N. O. Convolvulaceæ*. Burnouf gives the botanical name of the Sanskrit term *Kadamba* as *Convolvulus repens*. (Vide Sanskrit and French Dictionary, page. 136). The *Kadamba* of the Dekkan and Konkan belongs to *N. O. Rubiaciæ*.

* Bombay Drugs (Catalogue).

† P. 168, Ahmedabad Edition, 1889. Arya-Aushadh.

‡ Five Hundred Indian Plants: Their Uses in Medicine and the Arts, in Kanarese; p. 26, 1891.

SOME FURTHER ADDITIONS TO THE LIST OF SHELLS
COLLECTED AT ADEN IN 1892-95, CLASSIFIED IN
ACCORDANCE WITH THE PAETEL CATALOGUE.

By COMMANDER E. R. SHOPLAND, R.I.M.

(Continued from page 235.)

G. and S. Names.	Author.	Habitat.	Remarks.
<i>Murex pinnatus</i> ...	Wood.	Aden.	Sk. Othman, coral; only one specimen.
<i>Pisania situla</i> ...	Rve.	"	Do. R
<i>Pleurotama crenularis</i>	Lk.	"	Do. R
" <i>stitoma</i> ...	Jouss.	"	Do. R
<i>Daphnella rissoides</i> ...	Rve.	"	Sappers Bay, sand. R
<i>Triton convolutus</i> ...	Brod.	"	Sk. Othman, coral. R
<i>Ranella tuberculata</i> ...	"	"	Rocks, Sea-face. P
<i>Nassa coelata</i> ...	A. Ad.	"	Do. do. R
<i>Purpura echinata</i> ...	Ad.	"	Do. do. P
<i>Ricinus undatum</i> ...	Chem.	"	Do. do. P
<i>Ancillaria striolata</i> ...	Sowb.	"	Maala, Mud flats. R
<i>Mitra amabilis</i> ...	Rve.	"	Sk. Othman, coral.
" <i>dermestina</i> ...	Lk.	"	Do.
" <i>ericea</i> ...	Pease.	"	Do.
" <i>makemonas</i> ...	Jouss.	"	Do.
" <i>mercatoria</i> ...	Swain.	"	Do.
" <i>militaris</i> ...	"	"	Do.
" <i>micronata</i> ...	Swain.	"	Do.
" <i>obeliscus</i> ...	Rve.	"	Do.
<i>Columbella concinna</i>	"	"	Harbour, East shore, L.W.R.
" <i>regulus</i> ...	Sowb.	"	Do. do. R
" <i>zea</i> ...	Melv.	"	Dredged, Harbour R
<i>Harpa minor</i> ...	Rumph.	"	Sk. Othman, coral. R
<i>Cassis torquata</i> ...	Rve.	"	Do. do. Mud flats. R
<i>Terebra ligata</i> ...	Hinds.	"	Telegraph Bay, sand. S
" <i>textilis</i> ...	"	"	Do. do. S
<i>Pyramidella propinqua</i> .	A. Ad.	"	Sk. Othman, coral R
<i>Obeliscus sulcatus</i> ...	"	"	Do. R
<i>Eulima martini</i> ...	"	"	Do. R
<i>Ringicula acuta</i> ...	Phil.	"	Do.
<i>Solarium infandibulum</i> .	Chem.	"	

G. and S. Names.	Author.	Habitat.	Remarks.	
<i>Cerata ceylonensis</i> ...	Hwass.	Aden	Telegraph Bay, L. W.	R
<i>Pterocera bryonia</i> ...	Gmel.	"	Maala, Mud flats.	R
" <i>secreta</i> ...	L.	"	Do. do.	R
<i>Cerethium scabridum</i> .	Petit.	"	Do. do.	
" <i>tuberosum</i> .	Fabr.	"	Do. do.	
<i>Triforis cingulatus</i> ...	A. Ad.	"	Sappers' Bay, sand.	P
<i>Littorina scabra</i> ...	L.	"	Do. do.	R
<i>Rissoina Bertholetti</i> ...	Andom.	"	Do. do.	P
" <i>sequenziana</i> ...	Issol.	"	Do. do.	P
<i>Neritina fevilleti</i> ...	A. Ad.	"	Do. do.	R
<i>Minolia rotelliformis</i> ..	Phil.	"	Do. do.	R
<i>Atys ferruginea</i> ...	Ad.	"	Maala, Mud flats	R

BIVALVES.

<i>Psamobia rubicunda</i> ...	Desh.	Aden	Maala, Mud flats.	R
<i>Tellina inflata</i> ...	Chem.	"	Isthmus, Sea-face	R
<i>Mesodesma obtusa</i> ...	Crosset Els.	"	Do. do.	R
<i>Circe linvenia</i> ...	Romer.	"	Do. do.	
<i>Chione djiboutiensis</i> ...	Jouss.	"	Do. do.	R
" <i>rammoca</i> ...	Lk.	"	Do. do.	R
<i>Dosinia radiata</i> ...	Rve.	"	Do. do.	R
<i>Lucina concinna</i> ...	Ad.	"	Maala, Mud flats.	R
" <i>gemma</i> ...	Rve.	"	Do. do.	R
<i>Arca zebra</i> ...	Swain.	"	Do. do.	R
<i>Leda sculpta</i> ...	Issol.	"	Do. do.	R
<i>Lima tenera</i> , var : ...	Chem.	"	Do. do.	R
" <i>tenuis</i> ...	H. Ad.	"	Do. do.	R
<i>Ostrea cuculata</i> ...	Bom.	"	Do. ; only one specimen.	

REVIEW * (*Continued*).

The eleventh order and the last in this book, is that of *Accipitres*, or diurnal birds of prey. The first family, *Pandionidæ*, has been the subject of much discussion. It contains only one genus, and the genus only one species,† the common osprey (*Pandion haliaetus*).

If there were more sorts of ospreys, they would very likely get an order to themselves. As things stand, it is quite as much custom as conviction that classes them with the eagles instead of the owls. The structure of the leg and foot, and of the plumage, which has no aftershaft, are owlsh, while the appearance, habits and eggs are those of eagles or, rather, of falcons. These last, indeed, rarely catch fish, and the osprey seldom anything else; but their ways of finding prey and stooping on it are much alike.

The osprey‡ is common throughout our province, wherever there is water deep enough to hold fish of a pound or more in weight. It can carry off much larger fish, probably up to its own weight or near it, and will not despise one not bigger than a man's middle finger. Such prey are gripped by the rough soles of the toes rather than with the talons, as may be illustrated, in a freshly amputated foot, by drawing tight the flexor tendon—an interesting study with any bird's foot. However, the ospreys are so great ornaments to our waters, and so little wanted in museums, that we hope they may be spared shot and steel. They are perfectly harmless to man, unless he keeps fish-ponds, and their plumage is of poor effect in a lady's hat.

The next family is that of the vultures. Although these are very easily distinguished from the nobler birds of prey by appearance, they are only separated, as a family, by the absence of true feathers

* *The Fauna of British India, including Ceylon and Burma*; published under the authority of the Secretary of State for India in Council, edited by W. T. Blanford.—Birds, Vol. III, by W. T. Blanford, F.R.S., London.

† Our Author, apparently, includes the American and Australian ospreys in the Old World species.

‡ The English name "osprey" is probably derived indirectly from the Latin "ossifraga" (bone-smasher), unhappily, as our bird does not break bones. Our translators of the Bible, indeed, make "the ossifrage and the ospray" two different birds in Exodus, XI, 13. But their "ossifrage" was probably a real "bone-smasher," a Lammergeyer, in short. The Hebrew word is "Peres," which is said to come from a root, meaning to break or crush. The Hebrew for osprey, on the other hand, is "Azaniah," so fine a word that one regrets its not having come into scientific use. The present specific name, indeed, has an unusually good "priority," being Pliny's.

from the crown of the head ; a baldness which, as we all know, extends in some species to the whole neck. The family, as here restricted, belongs to the Old World. The American forms are now classed apart, and the vultures seem to be absent from the Australasian region generally—an odd thing in the case of such very powerful flyers. Mr. Blanford notes that they “are confined to the tropical and warm temperate regions” of the old Continents, which, again, is odd, for some species breed at great heights, and soar higher than balloons, so that mere cold must be matter of indifference to them.

Their powers of sight are telescopic, and most of us have noticed how they gather, as if by magic, to carrion, aided, no doubt, by observation of each other, and of crows and kites, moving at lower levels. The first bird at a “kill” in Western India is usually the crow, the second the Pariah kite, and the third *Neophron ginginianus*, a small Peninsular race of the better-known *Neophron percnopterus*, “Pharaoh’s chicken.” This is itself found in our province, as far south as Kutch. It is to be known by its greater size and dusky bill and claws. These dirty white and black birds are sometimes (wrongly) called “Brahminy kites”—a name belonging to another bird altogether. They were much favoured by the old Egyptians, though not actually sacred, and were forbidden to the Hebrews as diet, under the name of “Rehain,” which our Version translates “gier eagle.”

Before these birds have got far with their meal, there comes from the upper air perhaps a typical vulture (*V. monachus*), but more commonly a griffon (*Gyps fulvus*), or his relative, the long-billed vulture (*G. indicus*). The first two are Palearctic birds, and do not breed with us. The last is a resident Peninsular species, and so is the white-backed vulture (*Pseudogyps bengalensis*), which is apt to join at the meal. These four large vultures are pretty well matched, and can seldom drive one another away. But the *Neophrons* and kites must stand off from them. Their revenge comes with the last vulture (commonly) at dinner ; a fine blackish bird with a red head and legs ; *Otogyys calvus*. As he drives off all the other vultures, he is sometimes called their “King.” But the use of this word is to be discouraged, as leading to confusion with an American “King-vulture” (*Sarcoramphus papa*) ; who exercises similar authority, and is better dressed to boot, with skin and feathers of many colours. Our bird’s

royalty is not recognized by the Marathas, whose "Raj-gidh" is not a vulture at all, but the great "adjutant" stork. This monster comes last of all birds to the carcase, and even the black vulture must give way to him. Further than that, he does not concern us at present, and we are done with our vultures.*

In the present classification the Lammergeyer (*Gypætus barbatus*) is removed from their ranks, and classed with eagles, upon the sufficient ground of his having a fully feathered head. It is, indeed, "somewhat doubtful whether this great bird ever attacks living prey, its food consisting chiefly of bones and offal," says our author, who adds that it "rarely descends on a carcase" and quotes Hume for even worse habits.

One comparatively respectable habit is that "of carrying up large bones and letting them fall from a height in order to break them, and it is said in the Levant to treat tortoises in the same manner." As far as the present writer has been able to observe, the carrying of anything in their claws is very uncommon with the vultures proper, at least in Western India. The young seem to be fed entirely from the crop, as young pigeons are, but not quite in the same way. The young pigeon spoons its food out of the parent's beak with the mandible delicately enough. Vultures are not so nice. But, at any rate, they do not go carrying bits of corpses about, and dropping them into tea-cups and tumblers, as related to new-come visitors on Malabar Hill. Mr. Blanford does not dilate upon this matter, and Jerdon (Vol. I, p. 6) is very brief about it. But it has some interest in Bombay, where the "Yarn" in question is as old as it is silly; and, to some of our citizens, offensive. It is a very reasonable function of this Society to put a good big stone over it.

To return to our lammergeyer and its diet. Like the true vultures, it has only blunt claws, unsuited for the capture of living prey of any size; and Mr. Blanford more than doubts the stories of its "pushing goats and other animals over precipices," so that it is a good deal more stupid and sordid in life than in the good little books. In our province it occurs in Baluchistan and the Kirthar Hills of Sind, and outside it in the southern parts of the Palearctic Region, except

* The late Sir S. Baker has somewhere described a similar succession in Africa. His last bird is the great "Marabout" stork, first cousin to our "adjutant."

China, always in bare mountain country. After the lammergeyer come the typical eagles, of which the golden eagle occurs, within our limits, only in Baluchistan and Sind. As it is rare, we quote *verbatim*: "this eagle breeds in the higher Himalayas, and Mr. Hume thought he recognized it in the Sind Hills and on the Makran Coast." The present writer saw an old and a young bird together in the Larkhana Division of Upper Sind; "about 15 miles from the foot of the hills," says the contemporary note, dated 15th March, 1882. They were on the ground near a village (where carrion used to be thrown out), and allowed of approach to about 40 yards distance, when they rose, and the light shot rattled vainly on their quills. The broad white base and dark tip of the young bird's tail were then very distinct, and the mother's great size noticeable.

These birds had been carefully examined with a glass before going near them, and the young one's tail specially noted for observation on its rising. In such a case this is needful, as the young of the next species (*Aquila heliaca*, the Imperial eagle) have, in "the lineated stage," the "tail broadly tipped with fulvous white, remainder of tail uniform dull brown." The Imperial eagle is to be seen, in the cold weather, all over our province (though not anywhere a common bird), and Dr. Jerdon found it breeding "in the Deccan," probably near Jalna, as he was stationed there. It is very commonly called, and taken for, a golden eagle, and the mistake is an easy one to make in old birds flying over head. If one can see the back, the white markings of the Imperial eagle, though very variable, will often be conspicuous enough to distinguish it by. Mr. Blanford has well rid us of the barbarous specific name "*Mogilnik*"; and even "*Imperialis*" was objectionable, as much too good for the bird. It is, as he says, "a sluggish heavy bird, often seen sitting on trees, sometimes on the ground in open country. It feeds much on carrion, though it also kills small mammals, birds, and lizards for food." Jerdon, indeed, says: "When it does condescend to partake of carrion, it allows no other birds to approach till it has satisfied its hunger." But the present writer once saw brown vultures, around a dead horse, bring an Imperial eagle to rather less than equal terms; within a few seconds after he joined them. The proceedings were watched through a glass, and the eagle shot and identified without being lost sight of meanwhile. The

vultures were not. But *Otogyps calvus*, the most pugnacious vulture, was certainly not present. A tame specimen of Dr. Jerdon's own was slow to resent, having its meat stolen by a tawny eagle (*A. vindhiana*). The golden eagle exceeds it in size, and several others equal it in that point, and far exceed it in beauty of plumage and "poetry of motion."

Aquila bifasciata, the steppe eagle, is a closely allied bird, long confounded with *A. heliaca*. It occurs in Khandesh as a cold weather visitor. Our Author does not record it from any other of our districts, but it may be looked for, in the winter, anywhere between Khandesh and our Western borders, wherever those are.

The next bird is a "British Indian subject," not recorded outside of Mr. Blanford's (present) province. This is the Indian tawny eagle, *A. fulvescens* of Jerdon, now *vindhiana*, found "chiefly in the drier districts, where this is by far the commonest eagle," and one of the best known to sportsmen, especially falconers, for this bold and unscrupulous little eagle is a great robber of the lesser birds of prey, sometimes with murder.

The specific term "*fulvescens*" is now attached to "Brooks's Eagle," the next on the list. This is a rare bird of Central and Western Asia and Eastern Europe, but has been procured "in the North-West Provinces, chiefly about Etawah," from which it may be conjectured that a few more winters will show it a visitor to the Punjab, perhaps to Upper Sind.

Two spotted eagles, *A. maculata* and *A. hastata*, close the genus.

The next is *Hieracus* heading the hawk-eagles, birds of a slender build, as compared with true *Aquilæ*, and inferior in size, on the average of species. This, however, is the only point of inferiority. They are cleaner in diet, always or usually killing their own game, and that in some cases with great skill and dash. Their plumage is often superior in beauty to that of the typical eagles, and the head of the family, Bonelli's eagle, is justly called by Jerdon "magnificent," and by our present author "splendid." It appears here as *Hieracus fasciatus*, and in our forests as the true "Mhor-ghar," the only bird of prey that can habitually kill wild peacocks on their own ground, according to native foresters. A smaller species, *H. pennatus*, is a scourge of the dove-cot and poultry yard, whose owner, if no naturalist, is apt to lay the blame on pariah kites. There seems to be a

misprint in the measurements of this bird, given on page 345. The male appears as "about 29" inches long, for which, perhaps, read "20." Jerdon gives "21 to 22."

Lophotriorchis kieneri is a rare bird of the same size, with black head and crest (two and-a-half inches long), but most remarkable for the chestnut colour of the underparts sometimes extending to the breast. Its occurrence in our province seems doubtful to our Author.

The black eagle, *Ictinæetus malayensis* "is not met with in the Malay Peninsula and Islands," and would be better known by Hodgson's name, *pernigra*. We have it on the Ghats.

The next genus is *Spizætus*, whereof "the oriental forms are distinguished by some writers as *Limnætus*," an unlucky name, as they are fowl of the forest, and by no means of water, nor of bays. We have one fine species, *S. cirrhatus*, *Limnætus cristaballus* of Jerdon. It is in all our forests; most abundant, perhaps, in those of Southern Kolaba; a great region for birds of prey. It is a fine bold bird, seldom seen to advantage on the wing, flying low through the forest, but with great speed and power when after quarry.

It is particularly noticeable for its fine crest, "4 to 6 inches long, black, and, except in very old birds, tipped white," which gives it the Maratha name of "Shenduri Ghar" (= the kite with a *shendi*, or "scalp-lock," not "red-lead kite"). The crest feathers are but slowly tapered and very flexible towards the tip, as "hackles" are. When the bird is in motion, they lie back close to the neck-plumage, and are invisible from below. From above (*e.g.*, from a cliff) they show as a conspicuous black stripe on the nape, and then only the bird is easily known on the wing. When he alights, up go the black plumes almost vertically. If in prey, they are drawn up by the powerful scalp muscles, till they seem to bend forward, quivering with the excitement of the bird. The present writer has never seen them in the horizontal position shown in our author's figure (p. 349), wherein they seem more like quill feathers stuck into the scalp.

They are very well worth getting for a lady, and this fierce wood-eagle is not a bird that much sentiment need be spent upon. Moreover, his arboreal habits prevent him from being any great feature in landscape, unless on the rare occasions when he chooses a big dead tree for look-out post. The best way to get him is to send

a man round his perch to put him out to the gun, as with green pigeons. He is not quite confined to forest, coming out into the plains where large trees are abundant, or to long, well planted avenues; even, at times, to well shaded villages, where the crows soon raise the alarm. This bird sometimes hunts by twilight. A party returning from field work in Gujarat saw what they took for a hare, sitting up on open ground, with cocked ears and unusually bold. Upon approach, the hare turned into an eagle, and flew away. A random shot in the dusk only made him drop what turned out to be an "Ice-bird" (night-hawk); with its back broken and breast bared of flesh. The nearest trees were some hundred feet away, further than a night-hawk will commonly go before dusk; and the quarry was still smoking warm. This bird is chiefly Peninsular, but a sub-species is found in Ceylon. We seem to have no other of the genus; and the Hawk-eagles end with it. Their following neighbours are the Serpent-eagles, who are to be distinguished (briefly) from all previously mentioned by their long bare shanks and diet; chiefly of reptiles and frogs. Of the first genus, *Circetus*, we have one species, *C. gallicus*.

This, though a large bird, cuts no great figure, except when soaring in circles, on the look-out for prey. Its action is rather like that of the Kestrels, Harriers, and some owls, checking itself, hovering, and dropping on the quarry, without the rushing stoop of the nobler species; the round puffy head is rather owlsh, and so, oddly enough, is the broad white egg. To do it justice, it does not eat carrion, the besetting meanness of the typical eagles.

As a bird of open country, and waging great war on snakes, it is well-known to the natives; and they have plenty of stories about it. But to Europeans the next bird is more interesting and attractive. This is *Spilornis cheela*, the crested Serpent-eagle; by some called the Harrier Eagle, with much propriety. For no other eagle so frequently and closely imitates the action of the Harrier Hawks; quartering ground at a little height often in pairs, with great pains and method.

It can "also be seen soaring, and may be at once recognized by the strongly marked bars on its wings and tail, and by its loud plaintive cry, which it frequently utters when on the wing"; and also

when sitting in a tree in the forest, if it wants to make out the position of its mate, or of fledged young. A party in such a place, two old birds and one (or rarely two) young, will answer each other from tree to tree for an hour together. They are not at all exclusively Forest birds, but "usually found on trees near water, especially the fine trees along irrigation channels and canals in Upper India; and along stream-beds" elsewhere. The under-plumage of good specimens is ocellated in a very beautiful fashion, black and white upon rich red-brown, so that a loose axillary feather, for instance, makes one think at first rather of some new pheasant—or other spotty game-bird—than of an eagle. These feathers are very effective in a hat—in small number. The crest is not. When erected under excitement it is like a short broad vertical fan, of equally short broad fan-shaped head-feathers, black above and white near the base. The white hardly shows in an angry old bird of full plumage. When in flight, or sitting quiet, the crest is folded back, and hardly visible, or not at all, in Western India. The figure (p. 359) given in our book represents a sort of intermediate semi-erected crest, which must be very rare, if it is drawn from life at all. The contraction of the scalp in a museum specimen would produce it easily enough. The size and plumage vary greatly; wherefore we had a lot of generic names for this bird; now happily despatched to the Limbo of vanity. The variations of plumage occur even within very limited areas, such as the basin of the Savitri, where the bird is abundant. That in size seems to be steadier; it increases as you go north.

This bird likes to sit on a big limb of a large tree well inside, and pretty low down. In such a position it will often allow a close approach; and sometimes startles a man, who has not been looking for it, by flapping hurriedly off, as he passes a few feet below it. The present writer once killed one with a pistol-ball, walking coolly up to it. Yet it is not unable to stand the sun; for a pair will circle round each other, late in a hot weather forenoon, for a long time, apparently just for pleasure, squealing to each other at intervals. Perhaps it was this habit, characteristic of the Pariah Kite ("chil"), which led some native to give it that bird's name in conversation with its god-father, Latham, over 100 years ago. The vague generality of most native names, except those got from the forest tribes by

some one having both their tongue and their trust, utterly unfits them for scientific use; the more as it is given to very few Europeans to know both birds and "vernaculars." We have no other bird of the genus.

Haliastur indus, the "Brahminy Kite" has "been classed alternately with the fishing eagles and with the kites, and is allied to both." Its bright chestnut back and small size easily distinguish it from the former and its aquiline shape from the latter, at any distance. Its habits differ according to position, as is the case indeed with many birds of the group. In ports, where it is sometimes very abundant (least in Bombay), its customs are as foul as those of the Pariah kite, and it "has no manners at all." But on waters remote from human dwellings, it feeds much like the Ring-tailed eagle, and has even been seen to attack a hare. The chief prey is of small fish, crustacea, and frogs. The species is of the Oriental tropics generally, unless two forms of the Archipelago and Australia are to be given specific rank, which seems doubtful. It is not desirable to shoot this bird. The plumage, so handsome at a distance, is coarse and poor in hand; and the bird often very dirty.

The true kites (*Milvus*) "are all birds of moderate size, with a long forked tail" which distinguishes them at once. *M. govinda*, the Pariah kite, is too well known to need remark, except that Mr. Blandford, rejecting the separation of *affinis*; the small Australian form, admits the specific rank of *melanotis*, the large Jungle kite (Hume's *major*) which has better looks; but not much better customs. The genus is spread over the whole Old World and Australia; the Pariah kite throughout the Oriental region between the tropics and some way outside of them. *M. melanotis* affects the Eastern Palearctic region from the latitude of Bombay to the borders of Siberia. It does not breed in India, except in the Himalayas. A smaller Western form, *M. migrans*, breeds within our province in Baluchistan, and is the scavenger kite of the Levant; as *M. iclinus*, the "carrion kite" of our fathers, was in Northern Europe.*

Elanus is a small genus of kites with long unforked tails. We have one species, *E. caeruleus*, not common; but occurring throughout our

* NOTE.—*M. iclinus* is now hardly a carrion feeder at all, in Britain and Northern France. This habit in many birds depends on man and his ways.

provision and breeding with us. Its habits, diet, and size are much those of a kestrel, but it is less a bird of the open; and the plumage, generally white below (except the wing-tips) and generally grey above, with a white head, is very different from the kestrel's generally reddish coloration.

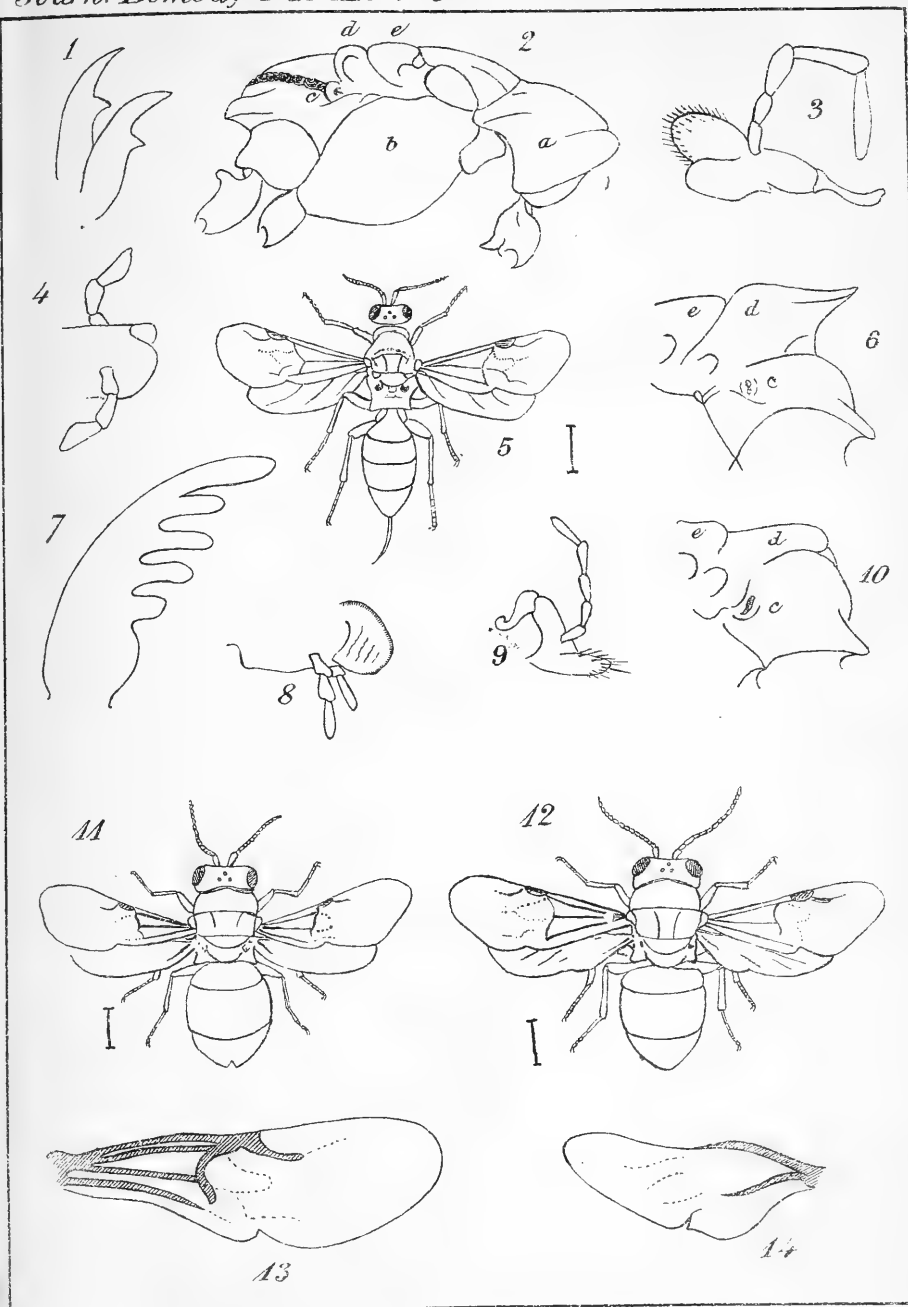
The Harriers (*Circus*) are a fine group of hawks, well known to our snipe and quail shooters, from their common habit of waiting on the gun and robbing the gunner. However, they quite as often help him by marking down birds which he retrieves after all. The English name is said to be derived from their method of quartering the ground, compared to that of "harriers" (hare-hounds) drawing for a hare. Neither derivation nor comparison deserves much faith, as the birds' action is much more like that of a pointer or setter; and doubtless they are harriers because they harry; like William of Deloraine, when he "Harried the lands of Richard Murgreave; and slew his brother by dint of glaive."

The Latin name is unlucky in another way. Harrier-circle less than most other hawks; and Homer's "*hirax hiros*" was most likely a "wheeling falcon." Natives, and some sportsmen, call them "kites," from their long wings and tail, but the latter is never forked; and they never touch carrion. Until lately they were often treated as allied to owls; but are now superseded in that connection by the Ospreys, for anatomical reasons. The French are apt to call them "pygargues;" but the classic "pygargus" seems to have been some other bird "living in towns and fields, with a white tail," says Pliny, who classes it second amongst eagles.* Modern harriers may be said, in a way, to have white tails; but they do not now dwell in towns. According to Jordan, Linnaeus, from whose "*Falco pygargus*" the French name is taken, meant the female "Hen Harrier," *C. cyaneus*. Mr. Blanford does not use the word at all, himself, and expressly denies it to Montagu's Harrier.

His first is *C. macrurus*, the Pale Harrier; "Blue Kite" of our last generation.

It is a handsome bird and well known by its gull-like plumage; pearl-grey above and white below, in old cocks; reddish below when

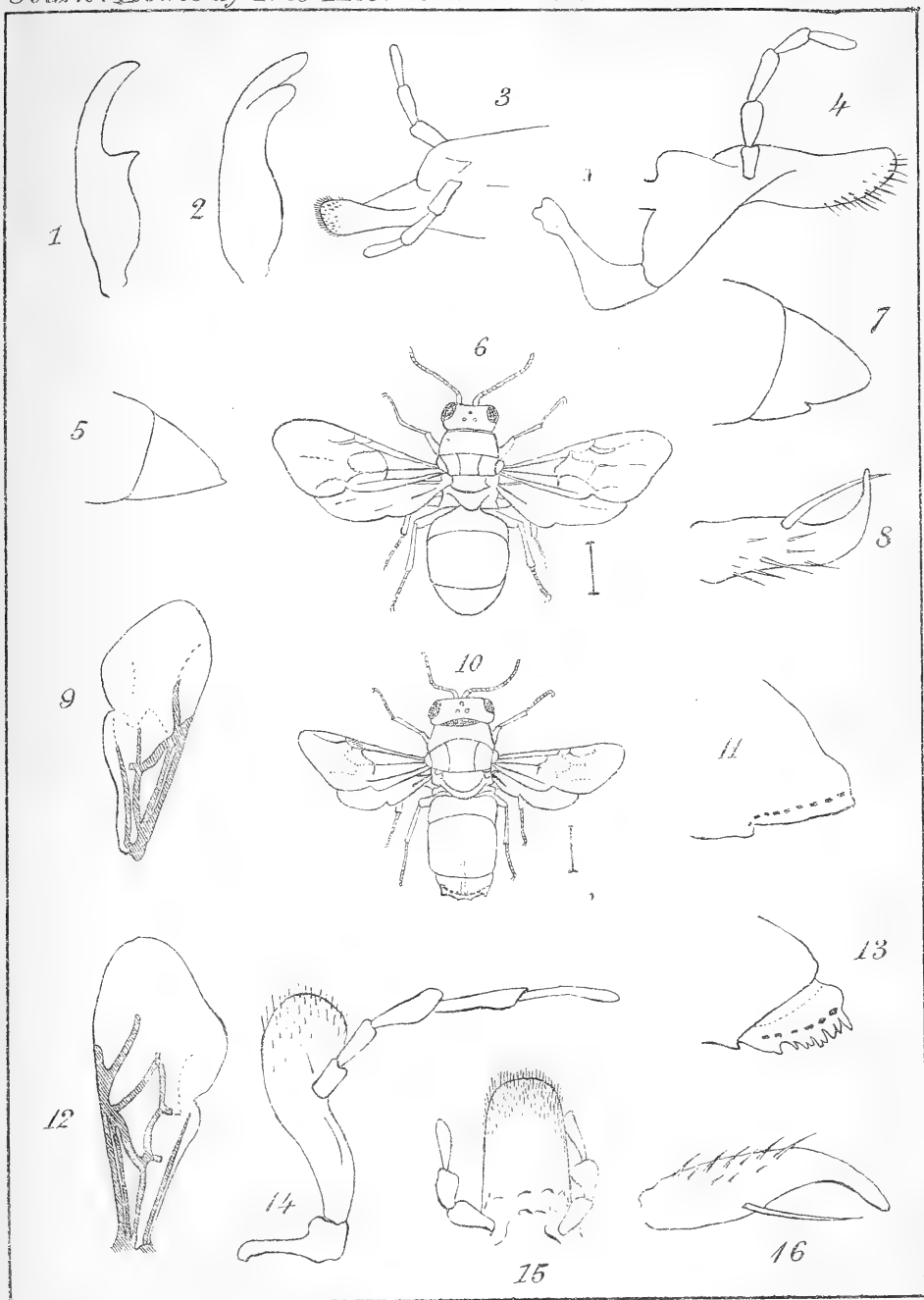
* Possibly this may have been an Erne. One of these is "second among Eagles in the Empire of to-day," and another does still build in "towns and fields," in India.



Robert du Buysson, del.

A.P. Carter, Litho.

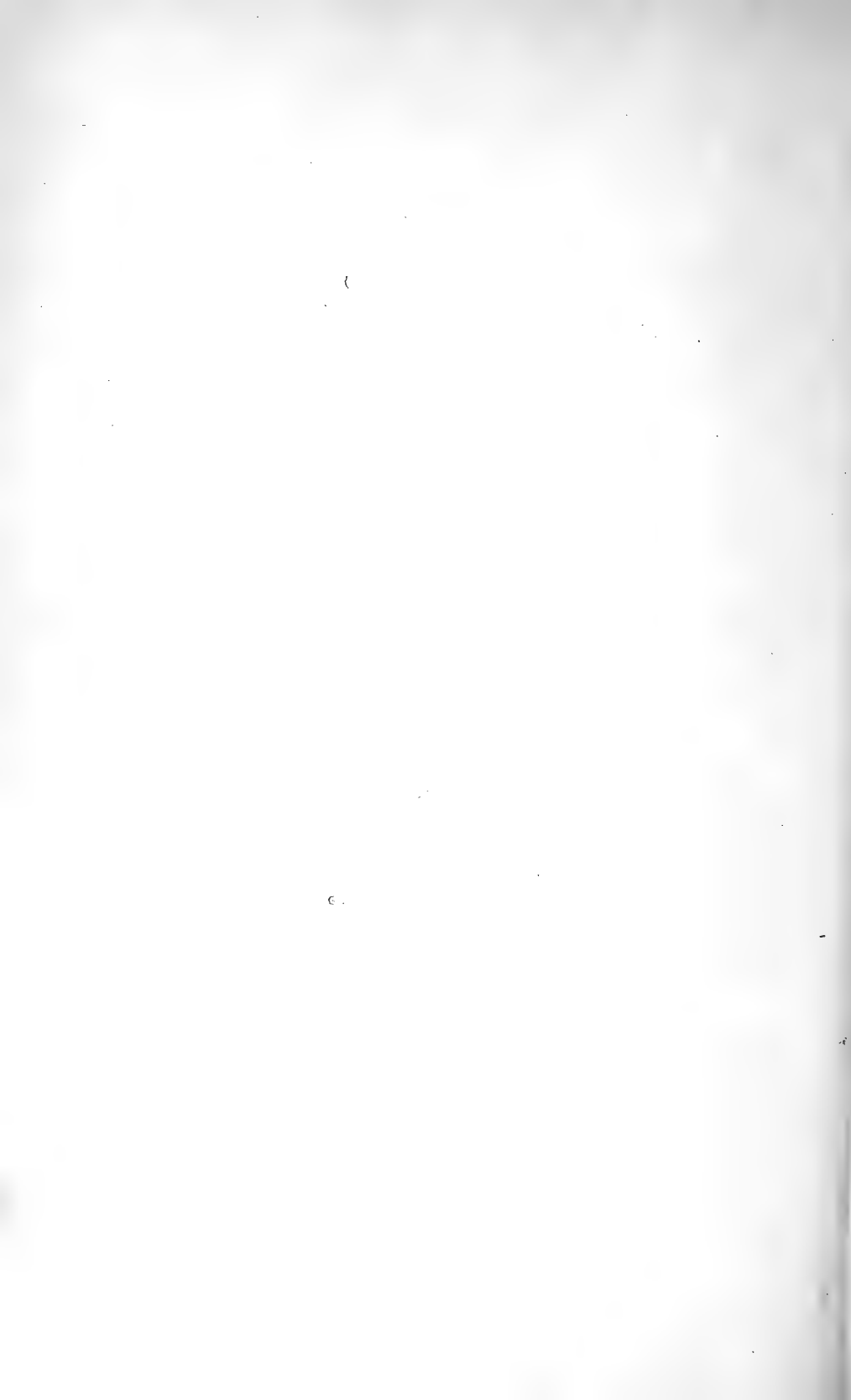
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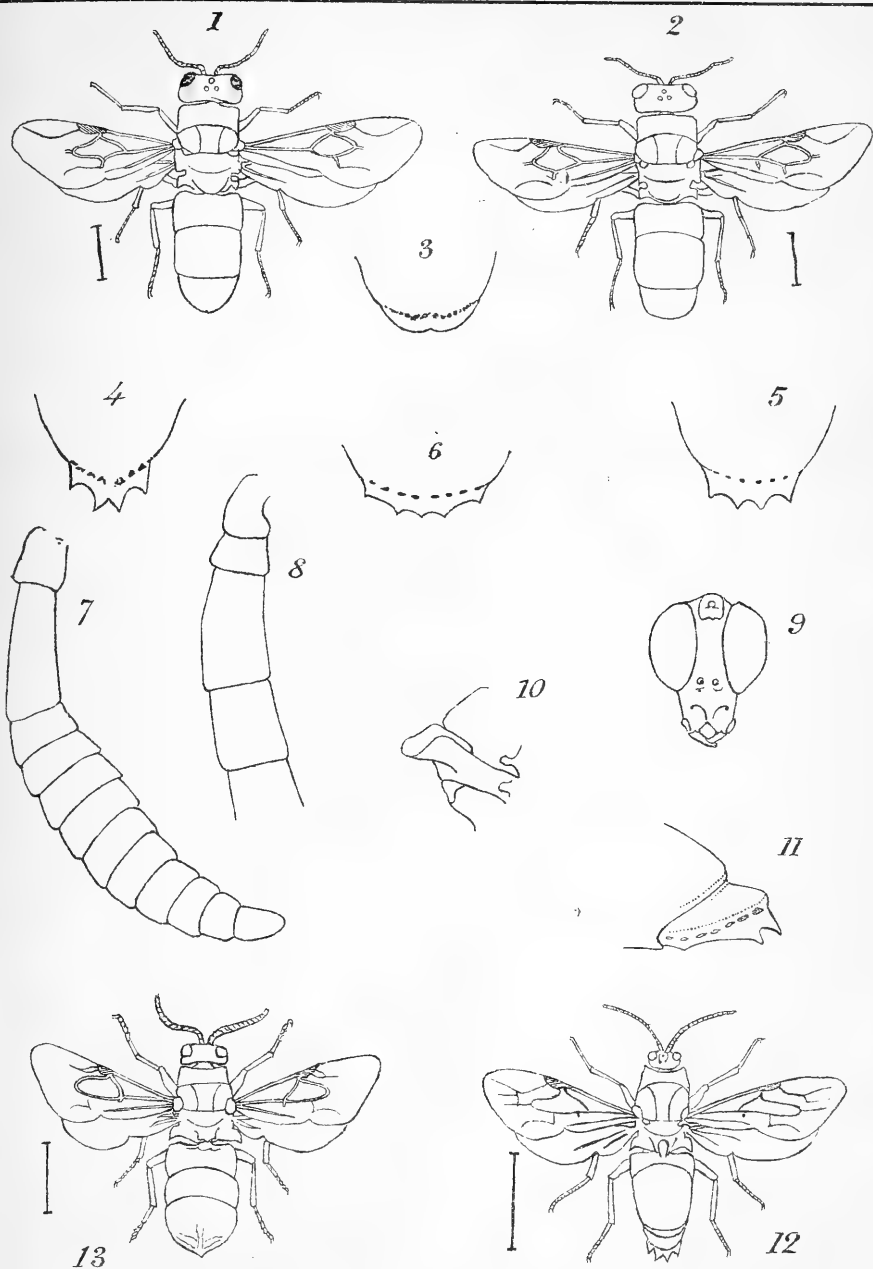


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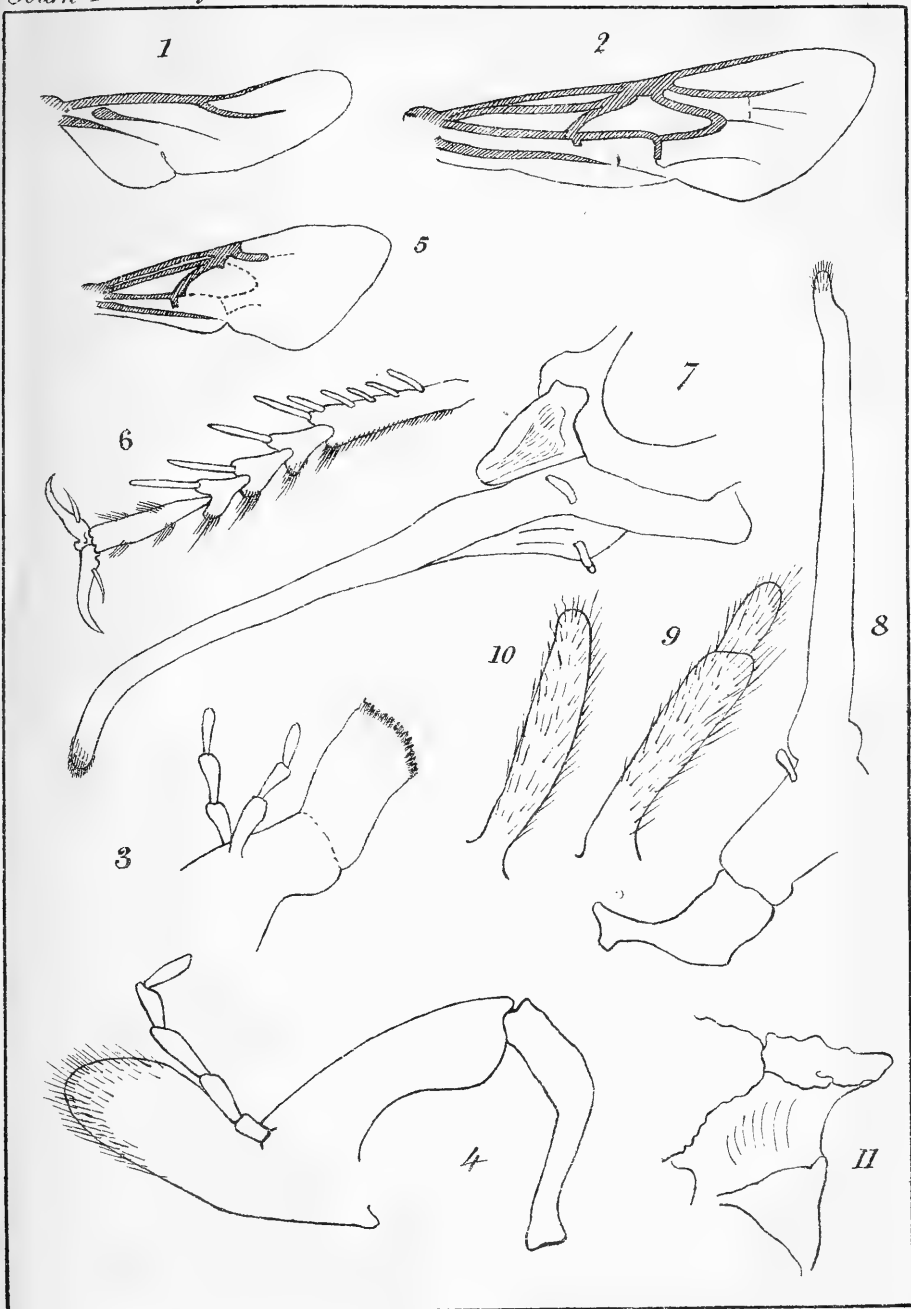
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INDIAN CHRYSIDIDÆ.









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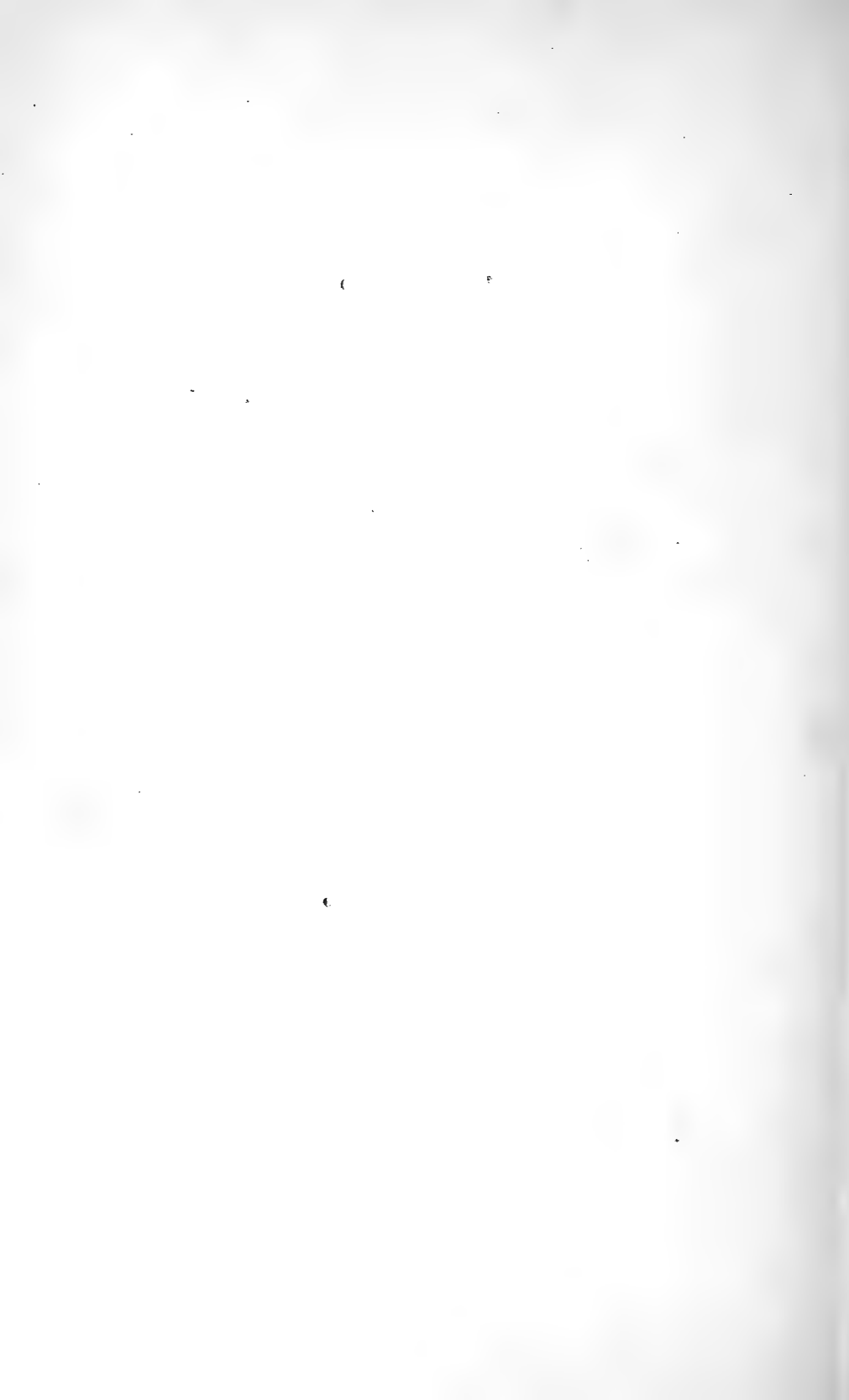
A.P. Carter, Litho.

INDIAN CHRYSIDIDÆ..





West, Newman chromo



young. Montagu's Harrier (*C. cineraceus*) is not unlike, and only an old hand could pretend to distinguish these birds on the wing. The latter is, on the whole, darker. The hens of both are brown-backed, and there are very gradual and confusing changes of plumage according to age. The Hen-Harrier and Pied Harrier are not Bombay birds; but we have the Marsh Harrier, *C. æruginosus*, a larger bird than our two above noted, and of generally brown plumage; a great thief of wounded teal, and sometimes distinguishable in flight, by rising higher from the ground than they do.

Circus spilonotus, a very similar bird, does not visit us, and no Harrier breeds in our province.

The Buzzard-Eagles (*Butastur*) form a small genus of small birds (for eagles); here well separated from Buzzards, to which they are not really close akin. We have *B. teesa*, a bird of the open country, of no great interest, unless as laying eggs white, or nearly so.

The next genus, *Haliaëtus*, contains the "Earns," a name not to be willingly let die, because it is good old English and begs no question. They are also called Sea Eagles and Fishing Eagles, but some do not go to sea, and some do not fish much, and there are other eagles who do.

There are three species in India, which all occur in one part of our province; the first of these is the type of the genus, the Earn himself, a bird of the Palearctic region, and even of Greenland; but only, with us, a rare winter visitor to Upper Sind. Though he does not breed here, it is worth while to note that he is, at home, chiefly a builder on cliffs.

He is by no means exclusively a fisher; but, in some places and at some times, an enemy to bird and beast; with no objection to carrion. He is the commonest eagle of the British Isles, especially in England, and some years ago one perched several times on a tower of Windsor Castle, and was reported to have actually been trapped there; a great pity—if true. Sir Edwin Landseer, long ago, got pretty well "heckled" for a great picture of Earns attacking swans with beak and claw. It was observed that the eagle's beak is not his sword, but chiefly his carving-knife; and that this particular eagle, so far from being in case to carve a swan, has frequently been defeated by the domestic gander of the Shetland Isles. Our native Earns are both of

them handsomer birds (though rather less in size) and of more respectable habits in general; but differ widely between themselves in ways and means. These are Pallas's Eagle, *H. leucoryphus*, and the white-bellied Sea-eagle, *H. leucogaster*, Jerdon's "Ring-tailed" and "Grey-backed" Sea-eagles. We shall use these names here, because they indicate the marks by which the birds can be most readily recognized on the wing. Both are, in our province, tree-nesters; and their Northern visitor might very easily find both at home, in an hour's flight over the Indus. But, in the rest of our province, the Ring-tailed Eagle's chief hunting grounds are by fresh water, shallow for choice, and the Grey-backed sticks to salt water; often of as much as ten fathoms near Bombay, much more where the shore is "steep-to." The Ring-tailed Eagle is partly a Palearctic bird, ranging at least to the Black Sea, and does not come as far south as Bombay; though common in North Gujarat.

He lives chiefly by fishing; but often strikes birds for himself, especially Bald Coots, and "goes about stealing ducks" from the fowler and falconer. The late Amir Ali Murad Khan, a good naturalist in his fashion, hated these birds for scaring and sometimes killing his hawks, like the Tawny and Bonelli's eagles. But they are not accused of "striking fur" nor of foul-feeding; nor of robbing the Osprey. They are very bold, and in little fear of man, building near towns, and even railway stations.

The grey-backed sea-eagle is a bird of the Eastern tropics on both sides of the line; probably not ranging west beyond Baluchistan, if so far; nor to any place north of the Himalaya. He seldom "strikes feather," probably never "fur," but is not above carrion, at least of fish; and is reported to rob the Osprey. But this does not seem to be his habit near Bombay, where they are both common, but apparently good neighbours.

They are not afraid of the fishermen; but dislike Europeans; and are apt to keep well out of range of small shot. The nest, though often not far from villages, is not such a very public building as that of the Ring-tailed Eagle; and the bird himself, though by no means silent or solitary, is not as sociable and conversational as his larger relation. A family of Ring-tailed Eagles, coming home in the evening, will let every one within a mile of them know of it.

There is one other Indian genus of fishing-eagles, *Policetus*, *P. ichthyætus* occurs in the Deccan and South Maratha Country, not commonly ; and may probably occur in Gujarat.

Its habits seem to be pretty much those of the Ring-tailed Eagle, but it is more exclusively a fisher. The bird itself is smaller, and has a white belly and tail, with a broad black tip. The other has a brown belly, sometimes almost chestnut, and brown tail with a most conspicuous white band. The Grey-backed Eagle has almost the colouring of sea-gulls generally, *i.e.*, white, with a grey back, but the tail is dark with a broad white tip. The Osprey, which is almost the only other bird likely to be mistaken for a Sea-eagle, is white below, except the breast, where there are brown markings, with a white head like the last eagle, and the upper parts dark brown ; looking black at a little distance. It has also a dark stripe from each eye down the white neck, which gives a very peculiar expression to the face, and is visible from some distance. Coupled with the very bright and powerful eye, it makes one think of those "human subjects," (generally of some character, or at least of healthy constitution and habits), whose clearness of eye remains undimmed, even after the "crow's foot" has found each corner. It may be added that, of these four ornaments of our waters, the Osprey alone plunges into them. If a large bird of prey is seen to descend on the water "slantindicular," and clutch up an object from the surface ; it is probably a sea-eagle. They even prefer to get sticks for nest-building in this way. If it plunges *almost* straight down (but never "plumb") sending the spray flying ; and emerging, after a perceptible but short period, with the fish clutched ; it is an osprey. The "Brahminy kite" is to be distinguished by its conspicuous coloration, and the other kites by their forked tails, both by their smaller size. The gannets, boobies, and terns plunge at a right angle to the horizon, otherwise, like the osprey ; the gulls and *Procellariidæ* (Albatrosses, Shearwaters, and Petrels) pick their prey off the surface like eagles and kites. But, of all these, only the eagles and osprey use the "clutches" in its capture. The webbed feet of the rest are paddles, and not weapons ; and, as they rise with prey, it is to be looked for in the bill, and not in the clutch. Its presence is known to the old fisherman (to whom a knowledge of such "sign"—

as it is technically called—is very important) by a sort of silver sparkle about clutch or bill. It is seldom possible, accurately, to distinguish the form of a wriggling fish in the grip of a flying bird. The *Phaetonidae*, or “Boatswain birds,” prey like gulls with the bill. The “Frigate birds” (*Attagen*, *Tachypetes*, *Fregata*) have their feet modified, so as to be, to some extent, “clutches,” and seem to take their prey in both ways. About all these, however, it is to be hoped that our author will shortly have more to say. What is necessary at present is to warn our readers that a great many of them are as big as sea-eagles, and to furnish, as far as may be, the means of distinguishing them on the wing. Without this, no museum classification can teach us their habits, and without observation of habits Natural History is lifeless. We cannot shoot and identify every bird we see. It may be said, in closing accounts with the sea-eagles, that they are not at all, as a group, to be put below those of the land, in size, beauty or manners. Perhaps, the finest “mount” of birds of prey in the British Museum is one of a group of sea-eagles from the North Pacific, worth going from Bombay to see.

After Harriers come Buzzards (*Buteo*), a common name in misuse. Buzzards are by no means “blind,” and “Turkey Buzzards” are neither Buzzards nor Turkeys, and do not live in Turkey, but in the warm parts of America. They get their name from the general resemblance to a Turkey of their dark plumage and bare red face. For the same reasons, our “Pondicherry Vulture” (*Otogyps calvus*) is sometimes called a “Turkey Buzzard,” which should be discouraged.

The true Buzzards are well described by our author as a sort of weak, sluggish, and dwarfish eagles. His first bird, *B. ferox*, we have only in Sind, though it ranges from the Levant to Sikhim. The next, *B. leucocephalus*, we have not at all; and the last, the common Buzzard, very rarely as a cold weather visitor. It may occur, however, almost anywhere in the Old World.

The next genus, *Archibuteo*, is not represented in our province.

We are better acquainted with the Goshawks (*Astur*), the chief of “the typical hawks.”

Astur palumbarius, the true Goshawk, is a Palearctic and Himalayan bird, not visiting our province of its own free-will, but imported, at

least lately, by the Amirs of Sind and the family of H. H. Aga Khan. It is "very big and bold and handsome," the "Shah Baz" of native falconers, and well deserves the name. It is a fine hawk for birds of short flight, hares, and (it is said) even gazelles. In the last case it was used along with greyhounds. But probably this sport, well described by the late Sir R. Burton, as seen in Sind, is now extinct.

Astur badius, the Shikra of good native falconers, is a little goshawk, found throughout our province, "except in thick forest, or in desert," and our commonest trained hawk, but only "up to" game of short flight and small size. *Astur soloensis* is a hawk of Further India and the Malayan and Chinese region, never found with us.

The Crested Goshawk) *Lophospizias trivirgatus*) is a forest bird that may occur in our Ghât region, Khandesh, or Mount Abu.

The genus *Accipiter* is almost cosmopolitan, but we have only two species, of which the first is a winter visitor, the English sparrowhawk, *A. nisus*. The other, *A. virgatus*, the "Besra" of native falconers, is a resident, a forest bird, slightly inferior in size, but considered a gamer bird. Trained birds of both species can, sometimes, kill partridges and pigeons, but that is "the length of their tether."

After the hawks, which are essentially carnivorous birds, we have the Honey-Buzzards, which are insectivorous mainly. They do eat honey, but much more young bees, old bees when they get them, and the like insects. They are said also to rob other birds' nests of eggs and young. We have one species (*Pernis cristatus*) in our Peninsular districts, where well wooded, not much in deep forest.

Passing over a few birds not found in our province, we come to the true falcons, perhaps the finest birds of prey, though some sea-eagles and hawk-eagles, with greater size, have almost equal beauty and spirit. The falcons, as well as the typical hawks, may "have from time immemorial been trained" by man. But the truth is that we do not know much about the origin of falconry. The Bible is silent on the subject, though the Arabs, who represent, on the same theatre, the primitive pastoral Hebrews, are now great falconers. "A falconer bearing a hawk on his wrist appeared to be represented on a bas-relief" which Sir A. H. Layard saw at Khorsabad. But that is all that he (who understood falconry as now there practised) has to say about

its having been known to the Assyrians.* Bonomi † mentions “a bird of prey, which seems by the shortness of its beak to be a falcon,” as perched on the head of a riderless horse in a hunting-scene from Khorsabad. The ancient Egyptians certainly worshipped a species of hawk, and at least half tamed them ‡ feeding eyesses and old birds, respectively, on the brains and flesh of other birds, of which quails are mentioned by name. But it does not appear that they trained them. However, in the first century of our era, Pliny had heard of some sort of falconry in Thrace, “above Amphipolis”§, though he did not understand it himself. Martial|| understood it fairly well, having, perhaps, seen it in his Native Spain. Had it been in Italy, Pliny would not have failed to know the fact and understand the matter. The very word “Falco” is not used by Pliny and Martial, who write “Accipiter.” Probably the art, under the Cæsars as under the Kaiser-i-Hind, was less in fashion in the home counties than in out-of-the-way provinces. One Julius Firmicus is said to have written about it in the fourth century. But in few libraries can a quotation from this gentleman’s works be verified. It is to be hoped that some of our Sanskrit-reading members can tell us the age of falconry in India. It is now most practised by Musalmans, and the technical terms seem to be mostly of their importation. But the Bedars of Shorapur, who are a pretty old Peninsular breed of quasi-Hindus, practised it as a “home industry” in Meadows Taylor’s day. It does not appear to be found in our cave-temple paintings or sculptures.

The Badminton writer on the subject treats it as “the most ancient of sports” (Coursing and Falconry, pp. 217, 219), apparently on the strength of Sir A. H. Layard’s note quoted above. But, even if the Assyrians did practise it, they seem to have preferred almost every other form of the chase that was known to their civilization, from throwing the boomerang up to hunting lions in chariots.

* Nineveh and Babylon, 1853, p. 483, note. This note seems to be absent from the abridgment of 1882.

† Nineveh and Palaces, 3rd edition, p. 202.

‡ Aelian, *De Naturâ Animalium*, LVII, c. 9. He wrote in the Second Century, A.D.

§ Nat. Hist. Book X., Cap. 8. The region indicated is that of Mount Rhodope or thereabouts.

|| Epigrams, Book XIV, 216. Martial’s “Accipiter” was, he says expressly, one that had been wild; what modern falconers rather loosely call a “passage hawk” and not an “eyess” or hand-reared nestling.

Modern savages seem to acquire the use of projectiles, up to archery ; of lines, nets, and snares ; of metals, up to iron ; and of tamed mammalia, up to the horse ; before they learn falconry ; and are generally poor hands at poultry-farming of any sort.

The use of short-winged hawks for short-winged and ground-game is possible to people even so little civilized as the Bedars of Shorapur ; and Martial's falconer, who could, like them, use dogs to help, may have been little above them in condition, and even lived by his trade. But for any great development of it there can be little chance without a class of sportsmen of wealth and leisure, such as the Arab and Tartar chieftains, the Assyrian kings, the mediæval princes and barons, and the feudatory Princes of India.

When these get civilized up to the use of good sporting firearms, it is the beginning of the end of falconry ; which is not likely to see A.D. 2000,—more's the pity.

We have been rather prolix about falconry ; because, to many of us, it is the chief interest connected with falcons. And its history has required criticism rather than its practice, because there are plenty of good English books about the latter (one of which has been quoted), and it is a frequent subject of periodical literature.

To some of us, however, the wild falcons, as noticed by our author, are nearer and dearer. His genus *Fulco* includes the large falcons and the hobbies. We have two hobbies—the European *Fulco subbuteo*, as a cold weather visitor from the Palearctic region ; and *F. severus*, a resident of the whole Oriental tropic region ; at least down to the Line. Both are small graceful birds, chiefly³ insectivorous, and chiefly interesting to such readers as need little further remark upon them here.

The typical falcons require more notice. They are large birds from 18 to 23 inches long, and noticeable afar by their long pointed wings and rather long rounded tail, but not so long in proportion to the wing as a typical hawk's. Their position in the air is lofty, and they have a very powerful and graceful flight. Their characteristic stoop on prey is somewhat like that of the osprey, but more curved, as an Indian "tulwar" is more curved than an English sabre. But there need be no confusion with the osprey, as it is much larger, and never stoops over land. The falcons never stoop *into* water, preferring the air. If

either bird has to take prey out of its own element, it resorts more or less to the accipitrine method of clutching.

The wild falcon, however, seldom following prey much larger than itself, generally "cuts down" its quarry from the air; and if you see the victim stricken dead to the earth by a blow from above, the slayer following after a moment's rise and hover, you may be pretty sure that the latter is a falcon. This is very well illustrated in the Badminton "Falconry." The novice had better note that what look like forked tails in its plates are the trained hawk's "jesses."

In this operation, the only weapon used is usually the long hind claw, which ploughs into the back or neck, or is even driven through the skull. The neck is the right point of attack, and is sometimes severed by the stroke. But in some cases, and especially in that of trained hawks attacking quarry larger than they would face if wild, the falcon "binds" and descends to the ground with the still struggling victim held by both "clutches." Some hawk-eagles, at times, "cut down" prey like a falcon; the typical hawks very rarely.

It is a pity to shoot a falcon, but it must sometimes be done for purposes of identification. The first thing noticed, if the bird is in good case, will be the beautiful plumage, suggesting steel scale-armour. Then the second feather in the wing is the longest. In *Astur* and *Accipiter* it is usually the fourth. In *Falco* the irides are usually dark brown, and in the short-winged hawks yellow or orange, whence the native falconers' distinction of "Kala-chashm" and "Pila-chashm." The whole bird has, alive or dead, an air of high-caste about him that no other flying creature can do more than approach. For further distinctions, and especially those between species, this is hardly the place.

We are pretty well off for falcons. The typical Peregrine is a cold weather visitor, haunting water and marsh. The closely allied Sháhin (*F. peregrinator*) is a resident, but not common, and almost confined to broken or wooded country.

The Barbary Falcon is a winter visitor to Sind and North Gujarat, a frequenter of open plains. It may very likely breed about Quetta, as its nest has been taken "in the Gumal Pass, near Dera Ismail Khan," and north of that, in the hills.

Falco jugger should be now spelt "Jaggar," which is the native name of the "Tiercel" or male, as "Laggar" of the female. But

although Hindustani cacography is subject to correction, in scientific Latin it is stereotyped by priority. You may make a new species, or, more easily, a new genus, but must keep your hands off a venerable missyllable.

This is by far our commonest falcon, a fine bird, little afraid of man, even breeding close to his dwelling, usually in a tree, and hunting over his fields and pastures.

Falco sacer, the "Charag" or "wheeling falcon," is the largest of ours, a cold weather visitor in Sind; but often brought, by falconers, much further south. It is the falcon with which the Amirs kill pariah kites; but this is accomplished only after severe training and (it is said) physicking. Mr. Blanford says that it is still trained to strike gazelles. In Sind that feat is now traditional of the goshawk. *F. milvipes*, an even larger Tibetan bird, has been obtained in Baluchistan, but little is known of it.

The genus *Erythropus* contains two small, but (as our author justly says) "beautiful" falcons, of which one, *E. amurensis*, the Eastern Red-legged Falcon, ranges from Manchuria to Somaliland, or thereabouts, breeding, of course, near its northern limit.

It occurs, as a rare cold weather visitor, in our province. Indeed, it may be more common at the seasons of migration than we suppose, having been much confused with kestrels, from which it is here well separated.

The next of the minor falcons are the merlins, *Æsalon* (not, as too often, *Æsalon*), little birds, with grey backs and whitish underparts, by which they may be distinguished from the more rufous kestrels, but not always with ease in the case of the English species. However, it is only, with us, a winter visitor to Sind, and it seldom hovers in one spot, like the kestrel, never for long.

The only other Indian species, the Turumti (*Æ. chicquera*), is, when old, a most recognizable bird, from its clear gull-like body-plumage and bright chestnut head. Young birds are of a mixed coloration, rather confusing, which is probably the reason why Mr. Blanford has to tell us that "there is no young skin in the British Museum, though there must be more than 50 adults!" It is to be hoped that our members *will* not long allow this reproach to rest on the national collection. The bird is common with us, and breeds in trees in open

cultivated districts, such as the better parts of the Deccan, Gujarat and Khandesh. If a nest were marked by the unmistakeable plumage of the old birds, the young might be shot before the family broke up at the conclusion of their education, which probably happens early in the rains (as they are bred in the late cold weather), perhaps, however, as late as December. The bird is exclusively Indian, and lives chiefly on small winged quarry. Its specific name, as our author remarks, belongs of right to *Astur badius*. The native and European god-fathers must have been stupid and ignorant above even the average of people who tack fragments of barbarous tongues on to the classic languages. That's saying a good deal, for such specific names are wrong all round, probably seven times in ten. No two small birds of prey are more easily distinguishable by colour and habit and no two better known to any decent native falconer or *shikari* than the Shikra and the Turumti.

The Kestrels (*Tinnunculus*) are a small genus of small falcons, two in number, both palæarctic birds. But the English kestrel, *T. alaudarius*, does breed with us on very high lands, such as the Ghâts; and many specimens, from Central Asia and the Himalayas, visit our fields and plains in winter. It is best recognized, at a distance, by its habit of hovering over one spot, with quivering wings, and dropping vertically on prey, like our Pied King-fisher. The prey is of small reptiles and mammals and large insects; and, though its specific name implies that it is "up to larks," any full-fledged lark is as safe from it as from the nearest gander. *T. cenchris*, the Lesser Kestrel, though a more Eastern bird, probably does not breed south of the Himalayas at all. It is a cold weather visitor to our opener country, with habits "very similar to those of the common kestrel; but this species is more gregarious and more insectivorous." Both are known to the Marathas as "Bhairú Sassa."

None of the falcons touch carrion, unless in dire extremity.

The genus *Microhierax*, "the pigmy falcons, or falconets, as they have been termed, are not closely allied to falcons, nor to any other group," and are not found in our province, being chiefly Malayan. With them ends the volume under review. It is to be hoped that, before all this has got into type, the volume we want most—that on the game, table, and water birds—will be in the market.

ADDENDUM.—ANTIQUITY OF FALCONRY.

The earliest classical notice of falconry is in "Aristotle's History of Animals," Book IX, Chapter 24, where he describes wild hawks as assisting Thracian fowlers by waiting on them, when the birds fell to the earth "through fear" and the men killed them with sticks.

Pliny has adapted this story without special acknowledgment beyond the words *traditum est*; (he acknowledges his general obligation to Aristotle elsewhere). But the quotation is marked by the next sentence, which, in both writers, refers to blackmail levied by wolves on the fishermen of the Palus Macotis. ("Natural History," Book X, Chapter VIII.)

He does not specify the means of actual capture used by the men.

Ælian, again, quotes the same story from either Pliny or Aristotle, still without acknowledgment (except the word *akono*), and improves it by giving the fowlers *nets*; into which the hawks drive the other birds. (Not. Animal, II, p. 42.) All three put the scene in Thrace, and all three describe the fowlers as giving the hawks some of the birds taken on the ground. All three think of the hawks as wild. It is tolerably clear that Aristotle knew and understood little of the matter, that Pliny knew nothing but from Aristotle, and that Ælian depended on them, except for his nets, which he may have put in as an improvement on the passage quoted. He has a bad repute for that sort of garbling.

Aristotle wrote in the fourth century B.C., Pliny in the first century A.D., and Ælian in the second.

But Martial, whose life overlapped both Pliny's and Ælian's, writes expressly and clearly in the epigram "Accipiter" (Book XIV, 216):—

"Praedo fuit volucrum, famulus nunc-aceupis, inde.

Decipit, et captas non sibi mocket aues;"

which may be roughly translated—

"Who want to take his prey of fowl, now, as the fowler's drudge,
Still takes them, but not for himself; and doth the same begrudge."

This epigram was written, or at least published, from Bilbilis, is what is now Aragon, in Spain, between 100 A.D., when Martial returned home after 35 years in Italy, and his death, about 104.

He clearly speaks of a hawk caught wild, and used afterwards in the chase. The fowler takes the quarry from the hawk, instead of giving it part of what he has caught, as in the Thracian story.

It is indeed just possible that the word *decipit* in the second line may refer to the use of a captive hawk as a decoy; and that the Thracian proceedings may have been of the same nature. But this involves a straining of the original in all the four writers quoted. Martial cannot have learnt his falconry in Italy, or Pliny and Ælian, both Italians and long resident there, would have known more about it than he. His story is quite independent of Aristotle's, and he does not seem to have travelled in any countries but Italy and his native Spain.

We have no reason to suppose that Ælian was ever in Spain. Pliny was, as a busy public officer (Procurator) in A.D. 71, 72, thirty years before the publication of Martial's epigram.

This, then, is the first clear evidence of the use of captured hawks by man, as known to a civilized gentleman; and it occurs in Spain, where the two best naturalists in the Roman Empire had apparently no knowledge of the subject beyond what Aristotle had heard over 400 years earlier.

It is not easy to prove a negative, but, if falconry had been well known to the Assyrians or Egyptians, whose civilization was by no means inconsistent with it, we should surely have had some notice of it from some of the Greek or Roman writers beyond four authorities, reducible to two, referring to European countries only. The observant Herodotus, the sportsman Xenophon, Aristotle's correspondents with Alexander's army, and the thousand educated Greeks and Romans to whom Mesopotamia was for centuries as well known as India was to us in the last century, would surely have formed and recorded some impression of so fascinating a subject.

There is, of course, a Chinese claim, as there is to the first invention of everything. Nobody but a Sinologist can judge of its value; but, among them, there seems to be a tendency to treat Chinese authority older than the Greek with diminishing reverence. No form of early Japanese civilization is likely to have anticipated Chinese editions of the same matter. From America, from Australasia, from the negroes of Africa, we seem to have no evidence of native falconry.

MISCELLANEOUS NOTES.

No. I.—STRANGE BEHAVIOUR OF CROWS.

Is it known that the common crow, amongst his other qualities, displays intelligence to such an extent as to make himself your self-constituted and rather successful shikaree?

When out the other evening trying to pick up a partridge or two for the pot, I got off the grassy plain on to a knoll covered, not thickly, with bamboo clumps and a variety of trees, some in flower and some not. In the very centre there were a couple of huts and a patch of cultivation. While looking about, a green pigeon betrayed itself, and consequently a whole flock by fluttering in a tree about 50 yards away. I got a couple and lost sight of the rest as they flew round, but the shot also disturbed the never-to-be-got-away-from crows round the huts. These saw me pick up the dead birds and then flew away, but not to their old ground. They came back in a minute or so and went away again, and repeated the operation so often as to make me watch them and ultimately follow the line they took. On reaching the tree which they invariably went to, away went the pigeons out of the next one, and I got another. Away also went the crows, but only to repeat their former performance with a similar result. In this way they took me four times to the pigeons before the latter forsook the knoll altogether.

Now, what I want to know is, is this a well-known and common occurrence, or did the crows, by watching me pick up the dead birds, merely see a chance of gratifying their thirst for mischief accidentally?

W. SUTHERLAND.

SOUTHERN SHAN STATES, BURMA, *January*, 1896.

No. II.—THE POISONOUS PLANT SHEULA.—(*AMORPHOPHALLUS COMMUTATUS*, ENGLER). A CORRECTED DESCRIPTION.

BY DR. J. C. LISBOA.

My intention in writing this note is to recall attention to the plant *Sheula* which has been the subject of a previous communication to the Society by Dr. Kirtikar.

It is of special interest on account of the difficulties met with in its study from the fact that the leaf and inflorescence appear at different seasons and the general resemblance between this and some allied plants. The remarks I have to offer are the result of unremitting attention to the subject during the last two years, the observations of the past year having been carefully checked during the current year.

The plant has been partially described as *Conophallus commutatus* by Schott. In Engler's work on *Araceæ* no mention is made of the leaf of this plant. In Hooker's "Flora of British India" it is stated that the leaf is unknown, and in the Journal of this Society there is a good picture, from an artist's point of view, representing the inflorescence of this plant, with the leaf of another (*a*) and the name of a third (*b*). Such then being the present literature of this plant, I need no further excuse for once more inviting your attention to the plant.

Sheula is abundant on the Western Ghâts from Bombay to Kumpta, very common at Matheran, and in Kanara it is called *Sooringadel*.

Like many *Aroideæ* it contains an acrid principle, but its stalk after maceration in water and due preparation is eaten by people, mixed with acid fruits, such as *koorak* (*Garruga pinnata*), tamarind, &c.

Specimens of *Aroideæ* are difficult to preserve in herbaria, and it is evident that Schott had scanty materials for his description; and certainly his materials could not compare with the abundance of specimens available to any one who spends the month of May at Matheran and takes the tubers with him to Bombay or Poona and cultivates them till the leaves have sprung up later in the season. Therefore, I purpose to describe the plant fully from recent specimens.

Amorphophallus commutatus, Engler's Arac. 319; Hook., Fl. Brit. Ind., vol. vi, 515; *Conophallus commutatus*, Schott, Prodr. 128. *Sheula*.

Annual tuberous plant.—Tuber oblate-spherical, about 4 by 2 in., depressed on the upperside. Several thin rootlets and a few bulbils arise from the main tuber. The bulbils send up leaves very rarely. Inflorescence appears at the end of May or soon after the first rains, when the smell is very disagreeable. Peduncle 1·3 ft. in length and about $\frac{3}{4}$ in. in diameter at the base tapering upwards, and variously maculated (light purple and white), and rough from minute spinules. Cataphyls 2 (sometimes 3), pale rose-coloured sheathing the base of the peduncle and ending in an acute point, the longest about 4 in. Spathe leathery, brownish-purple on the outer surface and pinkish-purple on the inner, 6-10 by 2·5 in., broadest at its middle, rough inside at the base, ovate-lanceolate, acute or acuminate; margins free, overlapping each other. During the expansion of the inflorescence, the margins are separated except at the base where they form a convolute tube covering the female portion. (*c*) *Spadix* sessile, columnar. Female flowers closely packed, occupying $\frac{1}{2}$ -1½ in. at the base, succeeded without appreciable interval by male flowers about $\frac{1}{2}$ -2 in. in height, these being directly

(*a*) *Sauramatum guttatum*, Schott. Prodr. 71.

(*b*) *Pythonium Wallichianum*, Schott. Prodr. 123, properly speaking *Tomsonia Nepalensis*, Wall. Phil. As. Bar., vol. I, 83, t. 99. The description and drawing given by Dr. Kirtikar do not agree with the plates and description of Wallich (see the volume of our Journal above mentioned).

(*c*) The specimen on the table is figured from a photograph and cut to show the inflorescence.

surmounted by the cream-coloured, terete, slightly hollow and smooth appendage as long or longer than the spathe and about $\frac{1}{2}$ in. diameter at the thickest part, or slightly thicker than the male portion of the inflorescence.

Female flower.—The Ovaries numerous, unilocular, uniovulate (*d*), sessile, green, almost round, generally turgid in the middle, and gradually enlarged towards the top. Stigma entire, capitate and somewhat bent, of an orange-red colour. The ovule is suspended from an erect funiculus arising from the inferior aspect of the cell, and inverting the ovule, so that the micropyle looks downwards.

Male flowers have each a single sessile anther, at first round, straw-coloured, changing to brownish-purple, being marked by faint pink lines, and becoming enlarged and irregularly quadrate in outline: having two ovate chambers (thecae), each opening by a nearly circular pore, and traversed in a direction parallel with the longer axis of the anther by a membrane which divides incompletely the opening into two semi-circular halves. I say *incompletely* because it only extends for $\frac{1}{2}$ or less than $\frac{1}{2}$ the depth of the anther. The pores are frequently obscured by the emitted pollen.

The *leaf* is solitary on a petiole about 2 ft. in length by $\frac{3}{4}$ in. diameter tapering upwards, solid, rough and variously spotted, springing up from the top of the tuber, about a month or two after the peduncle. The lamina about 2 ft. in expansion, trisect; each primary division bisect, the segments rarely in well-developed specimens, repeated. The leaflets are, one terminal about $4\frac{1}{2}$ by 2 in.; two decurrent on each side, and two below the bifurcation, reducing in size downwards. The primary nerves run obliquely to a prominent intramarginal vein about $\frac{1}{8}$ in. from the entire edge.

The description of the inflorescence and leaf is here given in the order in which they appear above ground, just in the same way as it is applied to some *Aroidae* by Sir Joseph Hooker and others "Tuberous plants before leafing." Some botanists believe that *Sheula* is perennial, but this is not the case. On close examination it will be found that the young leaf, its petiole and the rudiment of the future tuber spring up at the end of June or during the month of July from the top of the tuber, and as they continue to grow (the leaf dying after the end of the rains) in October or November, the old tuber, on which they are fed, shrivels up and ultimately disappears: you can see this process in the plant before you which sprang in July last. Here the old tuber is still attached to the new one, which has now reached to the size of a small betelnut, and continues to grow. At the end of eleven months, *i.e.*, in May or beginning of the rains, it sends up its inflorescence on a stalk.

Dr. Kirtikar states that *Amorphophallus campanulatus* in its development follows the same process; in the description of *Tompsonia Nipalensis*, Engler

(*d*) In a great number of ovaries examined I have found 1 cell and 1 ovule only.

says : "Tuber altero annofolium-solitarium, altero cataphylla atque pedunculum emittens." *Sauramatum guttatum* and perhaps some other *Aroideæ* have the same life-history.

The present article is written to correct some of the errors which are observed in the previous communication above alluded to. When a short paper on *Psilotus* was read here by a member about two years ago, I gave to Mr. Phipson a note, pointing out a mistake which had been made by the author. This note was lost or forgotten, and the paper on *Psilotus* was printed without any correction. This was left to be done by Dr. Prain of Calcutta whose communication on the subject was printed in a subsequent number of our Journal.

Regarding the habitat of *Sauramatum* above alluded to, it is stated in Hooker's Flora of British India, vol. vi, pages 508, 509, that "*Sauramatum guttatum* is confined to North-West India, except Stocks' specimens should prove to be from the Concan, of which there is no evidence." This is an error from oversight or forgetfulness.

In the Botanical Magazine there is a drawing (4465) taken from the plant growing in Thana; and in the letter-press we find the following notes :—"A very remarkable plant, native of the East Indies, where it is probably not uncommon. Dr. Wallich detected it in Nepal, and Blume in Java. Roots of our plants were sent to us by our friend Mr. Law, Thana, Bombay, in 1848, and they flowered in the stove in the spring of the following year." These notes are signed W. S. H. (probably the father of Sir Joseph Hooker). And at the end of the letter-press there is an article on the cultivation of this plant signed "J. S.," which runs thus : "A tuberous rooted herbaceous plant, native of Bombay and other parts of India."

REPLY TO THE FOREGOING NOTE.

To begin with, I ask, whose description is the above note intended to correct? My description of *Pythonium wallichianum*, Kunth, given in a former number of this Journal, is materially correct. Additions will improve it, for I admit there may be omissions, even in other parts than those marked by me with a query. But additions are not corrections.

Dr. Lisboa says that my inflorescence is correct; but that my leaf belongs to *Sauromatum guttatum*, and that the name I have adopted—namely, *Pythonium wallichianum*—belongs to a third plant. To this my reply is that the inflorescence, leaf, and name belong to one and the same plant. The inflorescence and leaf were painted at different times during the same year by Mr. Isaac Benjamin, as seasonal changes in the growth of the bulb required, so far back as 1886, under my eye. If Dr. Lisboa will favour my Thana garden with even a hurried visit, before the end of this rainy season,

I shall be able to show him *P. wallichianum* and *S. guttatum* side by side. It will there be found that the leaf of the latter is markedly bolder, thicker and more prominently coarse-veined than that of the former. Note that, the Shewla leaf varies according to the size of the bulb. When the bulb is as small as a pea, the leaf is cordate or hastate, not unlike that of a small *Caladium*. When the bulb is of the size of a cherry, the leaf is trilobate like that of *Arum trilobatum*. When the bulb is of the size of a husked betel-nut, the leaf is pedate; when a little larger, the leaf is pedati-partite. The leaf in my plate is from a small-sized bulb; it is of medium size, and resembles roughly the full formed leaf of *S. guttatum*. Here lies the source of confusion. As described by me, the full-sized leaf is tripartite-decompound. For such a leaf to be thrown out the bulb has to be of the size of a large apple or orange, if not larger. My leaf, therefore, should not be compared with that of Wallich's, which latter is from a bulb four times as large as that shown in my plate. The fact that figures given in Wallich's plate and mine are compared regardless of the size of our respective bulbs, sufficiently speaks for itself. Wallich's bulb is more fully developed than mine, hence his leaf is fully tripartite-decompound, whereas my leaf is of medium size. Note therefore again, as observed already, that the leaf in this *Aroid* varies according to the size of the bulb. *En passant* I may observe that in the foregoing note, it is said that "the inflorescence appears at the end of May or soon after the rains, when the smell is disagreeable." I beg leave to say that it is not *when the inflorescence appears, but when the pollen is ready to discharge, or actually discharges itself*, that the characteristic carrion-odour prevails. There is an interval of four to six days between the appearance of the inflorescence and the maturation and discharge of pollen. I may usefully observe here that the Shewla plant is not mentioned in Dr. Lisboa's "Useful Plants of the Bombay Presidency," published in 1886. In addition to Dr. Dymock, whom I have followed in naming the Shewla plant as *Pythonium wallichianum*, Kunth, I am aware that the late Drs. Narayan Daji, Sakham Arjun and Vinayak G. Gidh, who were earnest workers in Indian Botany, had accepted the name I have adopted.

Having so far justified the scientific name I have adopted, I now turn to the consideration of the propriety of suggesting the name of *Amorphophallus commutatus* to the Shewla plant. To include this plant under the Genus *Amorphophallus* is not sanctioned scientifically, judging from its structural nature. Hooker's recent researches are my authority (Flora Br. Ind., vol. vi., p. 491, 1894). Hooker says that in the Genus *Amorphophallus*, there are no "neuters." I am prepared to show that in the Shewla plant there are "neuters." Therefore the Shewla plant cannot be classified as a species of the Genus *Amorphophallus*.*

K. R. KIRTIKAR, F.L.S.

* Engler includes *A. commutatus* among the "entirely doubtful species." (P. 318, Monogr. Phan. Prod., vol. ii, D.C.)

NO. III.—WOUNDED ANIMALS CARRYING THEIR BROKEN LIMBS IN THEIR JAWS.

One morning, in the cold weather of 1893, I was returning from an unsuccessful beat for bear in some low hills lying at the extreme northerly end of the Abu Range, when, seeing some chinkara, one of whom carried a good head, I stepped off the path and fired but without success. Having, however, another cartridge in my rifle and as they made down a gap between two small rocky hills, I followed, hoping to cut them off by going round the nearest. This I succeeded in doing and was on the point of firing again when a panther jumped down off a boulder above me on the hill-side and running forward for some thirty paces crouched down watching the "Jamjelle" with twitching tail and ears. He, evidently, was not aware of my presence, so stepping slightly to one side to obtain a more broad-side shot, I fired and he rolled over.

Having no more cartridges, I bobbed behind a rock and watched the panther, who presently picked himself up and limped off round some rocks immediately in front. Following carefully, I again caught sight of him; sitting up licking his evidently broken left forearm. At this moment, a native called out to his goats which, in the meantime, had rounded the foot of the furthest hill, upon which the panther looked up, listened for a moment, and then picking up his broken leg by the paw in his mouth made across the open to the foot of the hill from which he had first jumped; and still holding the smashed limb between his teeth, sprang up on to the slab of rock (which here sloped down to the plain on the right of the boulder before mentioned) and disappeared in the more broken formation higher up. Sending the goat-herd after my men, we proceeded on their arrival to track the panther, and had not gone very far along the hill-side when we came upon his cave into which he had evidently retired, as the marks of blood about the narrow entrance were quite fresh. Here we also found the fresh skin of a goat, quantities of bones and small heaps of dung deposited on the top and sides of the rock forming the roof of the cave. We then tried hard to get him out, cutting up cartridges to make squibs which we dropped down the cracks in the sides of the cave, and firing off blank cartridges, but all to no purpose, as we could not get him to show, and had at last to give it up leaving a man to watch the entrance of the cave. Being obliged to catch a train at the way-side station for my head-quarters, I left that day and was not able to return to this part of the country for some two months, when I learned that the man told off to watch the cave had left as no one came to relieve him, without having seen anything; and on paying a visit myself to the cave I found it evidently abandoned (no fresh dung or bones being visible). Although I have since paid this same cave periodical visits, I have found no signs of its being inhabited and so have with my shikari come to the conclusion that the

panther must have died inside the cave, and no other panther has cared to take up quarters so uncanny. I may add that I have not since used a .450 hollow bullet for big game. Had the above been solid, it would have entered the heart after breaking the leg at the elbow. The gazelles stood switching their tails, gazing at the panther, and did not see me till I fired.

R. H. HEATH.

BEAWAR, April, 1896.

One day, while I was out with my rifle in Kathiawar, I came across some wolves, and taking a shot at one of them, my bullet broke a hind leg high up. This wolf remained in some long grass, while the others made off. I approached the wounded animal to put it out of pain, when it got up and tried to follow its retreating companions. The broken leg swinging by the skin impeded its flight and made it very angry. Turning round and round as if in search of the cause of its disability, the wolf at length seized the injured leg with its teeth and giving a sharp wrench or two, tore it off. It then ran away as fast as it could on three legs, holding the detached limb in its mouth. I was so interested in this, that I did not fire again but remained watching the retreating animal through my field glasses. As far as my sight followed, the leg was retained in the mouth. I then followed in the direction taken by the wolf, but never found it again.

This story has sometimes excited suspicion, but I think there was nothing extraordinary in the biting off of the leg. I believe that foxes and rats will bite through the leg in order to escape from a gin trap. The carrying of the leg in the mouth was probably mere nervousness. I think that the wolf did not so much remember to carry the leg as it forgot to drop it.

F. H. JACKSON, COLONEL.

PALANPORE, 3rd May, 1896.

NO. IV.—ON THE OCCURRENCE OF *HALCYON PILEATA* (THE BLACK-CAPPED KINGFISHER) NEAR BOMBAY.

In case Mr. J. Brand's contribution of a live specimen of *Halcyon pileata*, the Black-capped Kingfisher, noted in the last number of the Journal, vol. x, p. 337, may escape notice, I think it is well to call attention to the occurrence of this Malayan and Chinese species so near Bombay as Kalyan. This is particularly interesting from the fact that it has only once been recorded from Western India before, viz., by Mr. Vidal, in his paper on the "Birds of the South Konkan," published in the ninth volume of "Stray Feathers," p. 49, in which he notes having obtained two specimens at Malvan in January, 1880.

The distribution of this handsome kingfisher extends throughout the Malay Peninsula and Archipelago, Siam, North Borneo and China as far as

Japan, and within the limits of British India is only found with any regularity on the Burmese coast and the lower reaches of the Ganges and its branches.

In the recently-published third volume of the "Birds of India," Mr. Blanford mentions that the species is seldom found far from the sea coast, which no doubt includes large rivers, as he records it as far up the Ganges as Monghyr, and I believe it also frequents the Irrawaddy for a considerable distance from its mouth, so that its presence so far from the sea as Kalyan is also interesting.

Mr. Brand's specimen was caught with bird-lime, but in the absence of any possibility of keeping it alive in the Society's Museum, it has been made into an excellent skin.

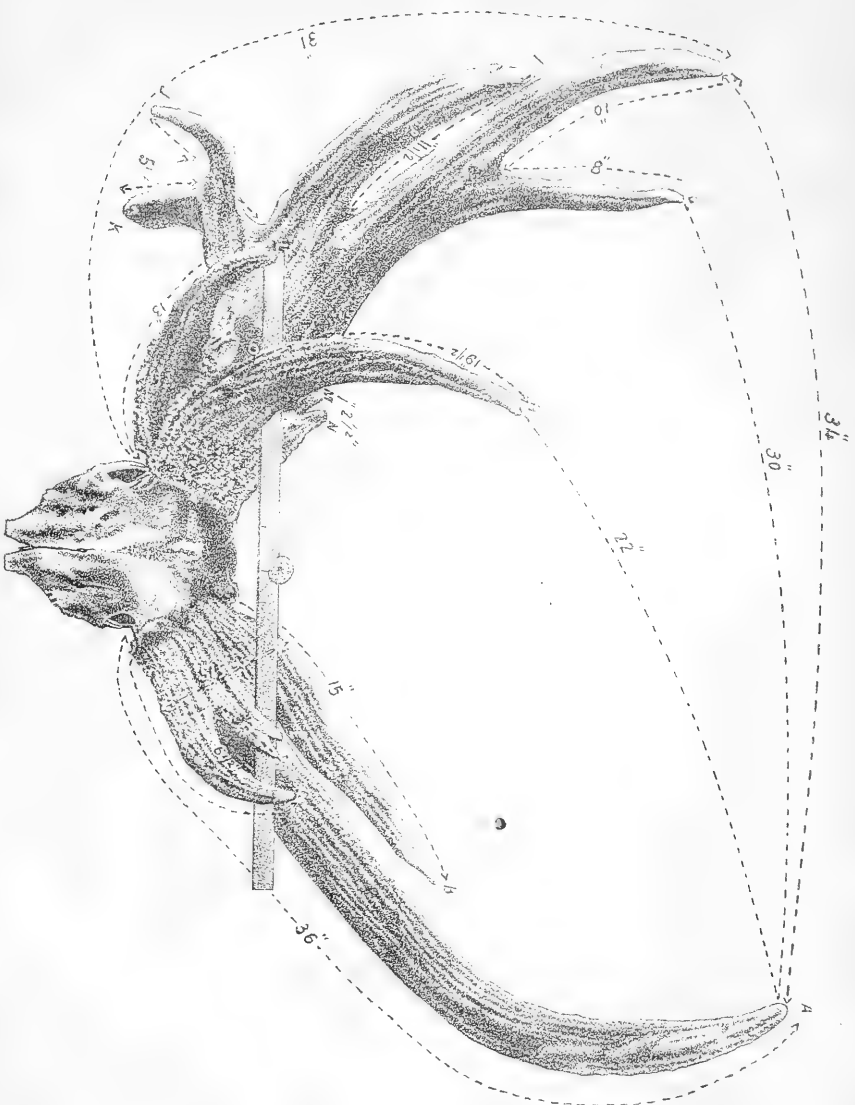
E. COMBER.

BOMBAY, 16th April, 1896.

No. V.—ABNORMAL SAMBAR HORNS.

(With an illustration.)

The two photographs of abnormal sambar antlers figured in the accompanying illustration, were picked up quite close to my camp in the Sásdá Sápudá forests, of Khandeish, on the 13th of last January. All that was found of the stag was the skull, horns, and leg bones, but it had not been long dead, as was evident from the unpleasant odour from the inside of his cranium. Mr. F. Gleadow has kindly taken the photographs and measurements as the horns are at present with him; he sends me the following notes. "The stag's horns were partly in velvet when it died: the fairly numerous but inconspicuous remaining hairs of that velvet are *white*: many of these hairs are still *in situ* in different places, the portions that remained in velvet can be distinguished in the photograph, *viz.*, the parts F, G, I, J, K, the top of A and H, and just the tip of L. The photo, perhaps, does not show perfectly that the little knot M, one inch high, is part of H, as is the case: that is because the point N, behind it, is irregular and looks either imperfectly ossified or diseased at the end. M is not merely a knot on H, although I have measured it as such, but can be traced as a ridge along H right down to the fork. In the same way D and E, which look in the print like a couple of 3-inch points joined together, clearly had their origin separately at the burr, but were crowded together and only recently became able to assert their individuality. At the bottom of the depression behind these is the orifice of a large blood vessel: near it is another in process of obliteration. At P and Q, two other large blood vessels emerge in the form of canals, as their course is nearly parallel to the surface: the canals are a good quarter inch in diameter. The point K I might call a stalactitic growth, rather than a point; it is very common in such monstrosities; the point is thick and rounded, the texture soft, and the direction downwards, looking altogether more like an escape from a sore than a point proper."



From Pinagayaphis.

A. R. Carter, [1881]

ABNORMAL SÁMBAR HORNS.

Cervus unicolor.

On upper surface of I at P and Q, but invisible from the front, two large blood-vessels, an artery A. Shows a cavity behind H extending towards the skull. at the back behind Q, is a ridge 3 inches long and 2 inches high, making in all 15 points.

The head is doubtless a case of injury to one or both testes, in this case perhaps the left being the chief sufferer. Such cases in the stag family usually lead to the undue development of horns.

L. S. OSMASTON,

Indian Forest Service.

CAMP, AHMEDNAGAR DISTRICT,

26th April, 1896.

NO. VI.—CURIOUS ACCIDENT TO A LEOPARD CAT.

This morning, some of my Nepalese coolies, when going to work, found in a tea-field a full-grown male Leopard Cat (*Felis bengalensis*) and a full-grown jack Hare lying dead not far from each other. The Leopard Cat had evidently surprised the Hare by springing on it, but in doing so had come in contact with the sharp pruned tip of a tea bush branch, which entered under the right armpit and penetrated at a slant into the left cavity of the chest, causing its death. This must have occurred in the small hours of this morning, as, when I saw the cat—about 8 a.m.—blood was still flowing from the wound. Such an accident is new to me and I should think was very unusual.

NORMAN F. T. TROUP.

KAUSANIE P. O., ALMORA, N.-W. P.,

12th April, 1896.

NO. VII.—SAMBAR SHEDDING ITS HORNS ACCIDENTALLY.

Last month, during a beat, I fired at a Sambar stag going across my front at about 40 yards distance; it at once rushed straight towards the bush behind which I was sitting, fell in a heap at my feet—within 3 yards—then jumped up and bolted, leaving both its horns (about 34 inches) on the ground, it was just as if it had said “I suppose you want my horns, take them and leave me alone.” The stag was only slightly wounded and got away all right, I am glad to say. The horns were quite ready for shedding.

E. LINDESAY, Major,

The Royal Irish Regt.

SAUGOR, C. P., 16th April, 1896.

NO. VIII.—LIQUID DISCHARGE FROM CICADA INSECTS.

When walking recently in the forests, on the outskirts of a small village, in the Pakhal Taluk of H. H. The Nizam's Dominions, my attention was attracted by what appeared to a shower of rain or drizzle amongst some Ebony and Palmyra trees beyond me. On approaching the trees, the shower increased quite sufficiently to wet my coat, and the well-known deafening

noise of the 'knife-grinder' insect (*Cicada ducalis*, I think) was heard on all sides. The trees for a distance of some 200 yards were densely crowded and covered with these insects, so much so that not a vestige of the bark of the trees could be seen. On the trees being tapped with a stick they flew off in thousands, settling again almost immediately not far off. The curious appearance of rain was caused by some fluid emitted by the insects, one of which I send you.* A little rain had fallen a day or two previously, and I am told these insects appear generally after the first showers, remaining on the trees for 2 or 3 weeks but apparently eating nothing. A humorous Gond informed me that they then die "because from making so much noise their heads drop off."

W. F. BISCOE.

SECUNDERABAD, 5th June, 1896,

No. IX.—NOTES FROM DEESA.

It has always been a matter of surprise to me, why so many Geckos (the small house lizards) lose their tails, and the following incident, which I recently observed, may possibly account for it. Two Geckos were seen, for some hours, cautiously climbing about and eyeing one another suspiciously, uttering occasionally a low noise. After many manœuvres they approached and a desperate conflict ensued. The one seized his antagonist by the tail, whilst the other fixed on to the hind foot of his adversary, but after some valiant struggles they parted and I observed in the jaws of one the tail of his enemy. The tail was still wriggling but it was quickly swallowed in spite of this.

I may add that the Geckos here are much larger than those in Poona and Bombay, and make a much lower and deeper noise.

I have always heard that the Nilghai was a comparatively fast animal, but am now inclined to doubt it. I put my greyhounds on to a fine bull Nilghai on one occasion, and we coursed it for some miles over a rough country. The hounds caught it up in the first 100 yards, but were not sufficiently powerful to pull it down. As soon as we got it out on to land where one could ride, I had no difficulty in catching it up, and after the first three miles the beast was so exhausted that I was able to trot alongside of it and touch it up on the flanks with my hunting crop. It was repeatedly brought to bay, and charged the hounds.

W. A. LIGHT.

DEESA, March, 1896.

* Identified as *Pezomachus subrufa*, Dist.—ED.

PROCEEDINGS

OF THE MEETING HELD ON THE 16TH OF APRIL, 1896.

ELECTION OF MEMBERS.

The election of the following new members was announced :—Surgeon-Colonel H. K. McKay (Jabalpur); Mr. Jehangier Bomanjee Dinshaw Petit (Bombay); Mr. H. G. F. Sargent (Deesa); Captain H. Clowes (Bombay): Bombay Government, Director of Land Records and Agriculture (Poona); Mr. Paul Gerhardt (Bombay); Veterinary-Surgeon G. W. McArthur (Rangoon); Mr. F. H. M. Pearson (England); Mr. S.M. Edwards, I.C.S. (Belgaum); Mr. H. F. A. Wood (Cuddapah); Surgeon-Lieutenant-Colonel J. W. Clarkson (Nasik); Mr. P. J. Pope, I.C.S. (Mangalore); Mr. F. A. Wright, C.E. (Burdwan); Bombay Government, Secretary, Separate Department; Surgeon-Captain E. Wilkinson (Waziristan); Mr. Chas. H. Roosmale Cocq (Mhow); Mr. John Macpherson (Bombay); Mr. Mowbray Howes (Selangor); Mr. Alex. J. Brown (Assam); Mr. W. M. Daintry (New York); Mr. B. A. Brendon, I.C.S. (Hyderabad, Sind); Mr. A. W. Whitley (England); Surgeon-Lieutenant F. Wall (Trichinopoly); Mr. Henry Bremner (Mhow); Sir Charles Farran (Bombay); Major J. H. Sewell (Allahabad); Mr. P. J. Corbett (Hyderabad, Sind); Mr. F. W. Shaw (Bombay); Miss E. Catchpool (Bombay); Mr. P. F. Wickham (Burma); Mr. J. Wolseley-Smith (Bangalore); Surgeon-Colonel H. S. Muir, F.L.S. (Secunderabad); Mr. Fitz Schleicher (Bombay); Surgeon-Lieutenant-Colonel E. Ferrand (Berhampore); and Lieutenant C. Woodhouse (Ahmednagar).

CONTRIBUTIONS TO THE MUSEUM.

Mr. H. M. Phipson, the Honorary Secretary, then acknowledged receipt of the following contributions to the Society's Museum since the last meeting:—

Contribution.	Description.	Contributor.
1 Grey Flying Squirrel ...	<i>Pteromys oral</i> ...	Mr. F. D. Whiffin.
1 Whistling Teal ...	<i>Dendrocygna javanica</i> ...	Mr. S. Habibuddin.
A number of Insects, &c. ...	.....	Major E. S. Masters.
1 Pintail Duck ...	<i>Dafla acuta</i> ...	Major H. D. Olivier.
1 Gadwall ...	<i>Chaulelasmus streperus</i> ...	Do.
1 Spot-billed Duck ...	<i>Anas pectoratorhynchus</i> ...	Do.
1 Red-crested Pochard ...	<i>Fuligula rufina</i> ...	Do.
1 Tufted Pochard ...	<i>Fuligula cristata</i> ...	Do.
1 Grey Quail ...	<i>Coturnix communis</i> ...	Do.
Head of a Cape Buffalo ...	<i>Bos caffer</i> ...	Capt. R. W. Gimlett.
1 Flamingo ...	<i>Phœnicopter usantiquorum</i> ...	Mr. W. C. Morley.
1 Shoveller Duck ...	<i>Spatula clypeata</i> ...	Do.
1 Gadwall ...	<i>Chaulelasmus streperus</i> ...	Do.
1 Stilt ...	<i>Himantopus candidus</i> ...	Do.
1 Snake ...	<i>Zamenis gracilis</i> ...	Capt. Baugh.
2 Hedgehogs (alive)...	<i>Brinaceus collaris</i> ...	Mrs. Shepherd.
2 Screech Owls ...	<i>Strix flammea</i> ...	Mr. H. C. Crawford.
2 Black-throated Wood-Part-ridges ...	<i>Arbericola atrogularis</i> ...	Lt. H. A. D. Fraser, R.E.
3 Short-eared Owls (alive) ...	<i>Asio accipitrinus</i> ...	Purchased.
A number of Crustaceans ...	.....	Surg.-Capt. H. Herbert.
1 Bronze-winged Dove ...	<i>Calcophaps indica</i> ...	Mr. C. C. James.
1 Skull of Barking Deer ...	<i>Cervulus muntjac</i> ...	Mr. Oliver.

Contribution.	Description.	Contributors.
1 Jackal (alive)	<i>Canis aureus</i>	Dr. A. de Monte.
Some Coralines and Corals ... ..	.....	Mr. W. W. Squire.
A number of Scorpions ... ..	.....	Mr. J. B. D. Adams.
1 Cobra (alive)	<i>Naja tripudians</i>	Surg.-Maj. K. R. Kirtikar.
1 Oceanic Teal	<i>Querquedula gibberifrons</i> ...	Major F. Graham.
1 Four-legged Chicken ... ..	.....	Mr. H. Bulkley.
1 Daboia (alive)	<i>Vipera russelii</i>	Surg.-Maj. K. R. Kirtikar.
1 Snake	<i>Lycodon aulicus</i>	Dr. T. Nariman.
2 Zebras' skulls	<i>Equus zebra</i>	Mr. A. Trevor.
A collection of Fossils from Kurrachee ... ..	.....	Mr. S. P. Leggett.
1 Albino Snipe	<i>Gallinago gallinaria</i>	Surg.-Maj. H. V. Harington.
1 Red-crested Pochard	<i>Fuligula rufigula</i>	Maj. W. Richardson.
A number of Scorpions from Sind... ..	.....	Mr. G. M. Ryan.
1 Madras Tree-shrew... ..	<i>Tupia ellioti</i>	Mr. Rob. Wroughton.
1 Short-nosed Fruit Bat	<i>Cynopterus marginatus</i>	Mr. F. Gleadow.
1 Megapode	<i>Megapodius nicobaricus</i>	Mr. Wood, R.I.M.
1 Snake	<i>Lycodon aulicus</i>	Mr. J. W. Hind.
A number of Scorpions from Khandesh ... ..	.....	Mr. R. H. Madan.
1 Rock Perch	<i>Serranus lanceolatus</i>	Mr. A. Corrodi.
A number of Land Shells from the Satpuras ... ..	.....	Mr. H. Godwin-Austen.

THE ACCOUNTS FOR 1895.

Mr. A. Abercrombie, the Honorary Treasurer, laid before the meeting the accounts of the Society for the year ending 31st December, 1895, showing that while the receipts amounted to Rs. 16,123-8-6, the disbursements were Rs. 14,433-5-11, leaving a balance in favour of the Society of Rs. 1,690-2-7. The Society also possessed a Reserve Fund of Rs. 4,000 invested in Government Paper, and the value of the back numbers of the journal, estimated at the reduced rate at which they were sold to members, was Rs. 7,270.

It was resolved that the accounts be passed, subject to the usual audit.

PAPERS READ.

The following papers were then read and discussed :—1. Notes on the Indian Wild Dog, by J. D. Inverarity. 2. The Sheula Plant (*Amorphophalus commutatus*) and its correct description, by Dr. J. C. Lisboa. 3. The Butterflies of Mussooree and neighbouring regions, by P. W. Mackinnon and L. de Nicéville. 4. On some Earth Worms from India, by Sophia M. Fedarb. 5. Birds collected during five years' residence in the Hylakandy district, Cachar, by C. M. Inglis. Miscellaneous Notes :—(a) Notes from Deesa, by W. Light ; (b) Strange Behaviour of Crows, by W. Sutherland.

The Honorary Secretary drew attention to the giant clam shells presented by Captain J. E. Williams of the S.S. Changsha, one of which weighed 180 lbs.

Mr. W. Plunkett, Conservator of Forests, exhibited the skin of a black panther killed in the neighbourhood of Nasik.

Mr. H. Littledale announced that he had recently killed a tigress in the Baroda jungles and captured her four cubs alive. Two of the cubs were males and two females.

Bombay Natural History Society

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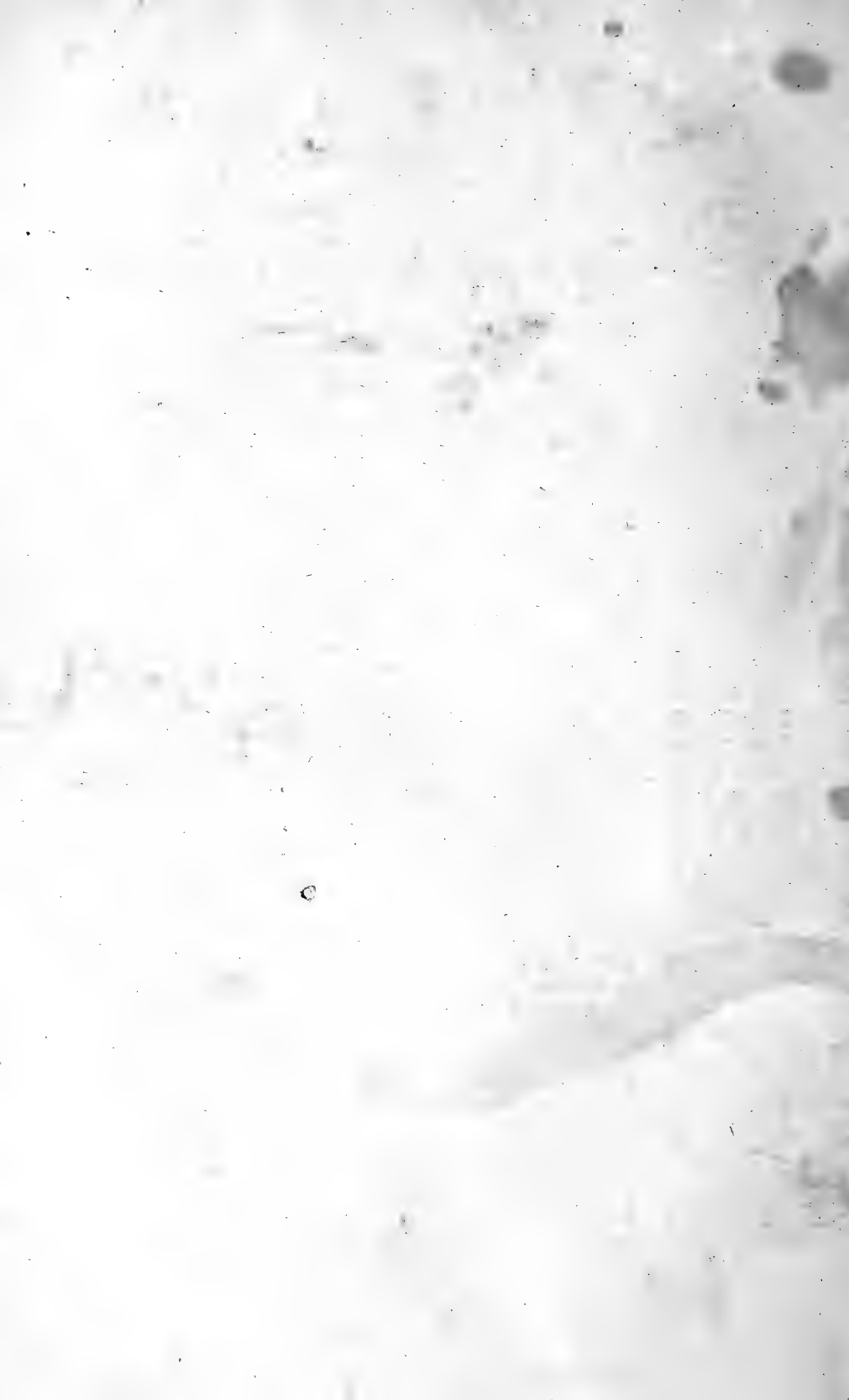
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E.C.S. Baker del.

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ALCEDO GRANDIS. ♂.
The Great Indian Kingfisher.

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THE BIRDS OF NORTH CACHAR.

PART VII.

BY E. C. STUART BAKER, F.Z.S., M.B.O.U.

(With Plate G.)

(Continued from page 371.)

Order—HALCYONES.

Family *Alcedinidæ*.

Sub-Family *Alcedinæ*.

(441) *ALCEDO ISPIDA*.—The Little Indian Kingfisher.

Hume, No. 134.

Very common everywhere.

(442) *ALCEDO BEAVANI*.—Beavan's Kingfisher.

Hume, No. 134 Ter.

This beautiful little kingfisher is not very rare, but is often overlooked as it is not easy to discriminate between it and the last species unless they are almost in one's hands.

(443) *ALCEDO GRANDIS*.—The Great Indian Kingfisher.

Hume, No. 135.

Practically all I know about this bird is recorded in Hume's "Nests and Eggs" (Vol. III, p. 4 *et seq.*), and it is therefore necessary for me to add but little here.

The dimensions of the eggs in my collection are $1\cdot10'' \times .88''$, $1\cdot06'' \times .87''$, and $1\cdot02'' \times .86''$. A single egg taken from another nest and not mentioned in the above article is only $\cdot97'' \times .88''$.

I may state here that nearly all I know concerning the different kingfishers was written under the *nom de plume* of "Rekab" some time ago in "*The Asian*," and all these notes have been introduced into Hume's "Nests and Eggs" under the names of the respective birds, so that I have very little to add here about them.

(444) CERYLE GUTTATA.—The Himalayan Pied Kingfisher.

Hume, No. 137.

Since writing the notes which appeared in "*The Asian*" and afterwards in Hume's book, I have seen one or two more nests, and these, like the one there described, were placed at the ends of very short burrows.

My eggs have unfortunately been destroyed during my absence on leave in England, and I can nowhere find any notes on their size, though I sent full notes to Mr. Bowdler Sharpe, which notes are, I believe, being used for the monograph of the kingfishers for which he is collecting materials.

(445) CERYLE RUDIS.—The Pied Kingfisher.

Hume, No. 136.

Common on the lower reaches of the Diyung, Jetinga, Jiri, and Jenam rivers, but not ascending any of the smaller streams.

(446) PELARGOPSIS GURIAL.—The Indian Stork-billed Kingfisher.

Hume, No. 127.

Personally I have only taken two of the nests of this fine kingfisher, both of which were placed in a high sandy bank of the Diyung river. Of the two holes, one was about $2\frac{1}{2}$ feet deep and sufficiently large in diameter to allow me to put my arm into it, almost to the shoulder; the other was fully 4 feet deep and about $3\frac{3}{4}$ inches in diameter at the mouth.

The chamber was not as large in either proportionately as the entrance, being about 14 inches long by nearly the same broad, and less considerably than 6 inches high.

The first nest was found on the 8th of June, 1891, and contained four young ones newly hatched; the second was taken two days later and contained a single egg only.

This egg is the only one I have which is really authentic, and unfortunately it is an abnormally shaped one, being a broad oval decidedly compressed towards one end.

In measurement it is $1.35'' \times 1.11''$.

I have twice had eggs brought to me said to have been laid by this bird, but in neither case was either of the parent-birds caught.

On both occasions four eggs were brought, showing slight signs of incubation, one clutch being made over to me in the early part of May and the other late in April.

The eggs, however, had been taken some days previously to being brought to me, and were most likely laid some time during the first fortnight in April.

The eight eggs averaged $1.38'' \times 1.26''$ and are not to be distinguished from some large eggs of *Halcyon smyrnensis*. It is not a common bird here, and as yet I have seldom seen it elsewhere than on two or three of the principal streams in these hills. It never seems to haunt the smaller streams and nullahs, but I have on several occasions observed it seated on some high tree, well away from any water, and whilst thus perched, it is rather fond of trying to emulate the white-breasted kingfisher in the way it gives vent to its discordant cries. Discordant, however, though they be, I do not think the latter bird need fear competition, being *facile princeps* in making disagreeable noises both as regards their quantity and quality.

Fish is probably the staple diet of this bird, but it by no means confines itself to such, varying it often with small lizards, crabs, prawns and anything almost which is not too large for it to tackle in comfort and safety. It is on record that this bird indulges a vicious propensity for robbing the nests of other and smaller birds, the contents of which it devours. To one of these burglarous and cannibalistic raids I was a witness in 1885 when living in Rungpur. In this place there are or were in the Collector's compound many fine but aged trees full of holes and crevices affording a very favourite nesting place for many birds. Amongst these a pair of mynas (*Acridotheres tristis*) had selected a large hollow in a big limb of one of the largest trees some forty feet from the ground. At the time of which I am writing the young birds were a few days old, and I had seen the old birds feeding them as I daily passed the tree on my way.

to cutcherry. One day, however, my attention was arrested by the shrieks of one of these kingfishers, accompanied by the cries of many small birds, most excited amongst whom were the two mynas.

Looking up I discovered a *Pelargopsis*, perched on the tree close to the entrance to the unfortunate myna's nest, uttering every now and then his unmusical notes, but taking no notice of the small birds which every few moments swooped at him in a half-hearted way, even the parents of the anticipated meal not seeming to dare to really attack him.

Finally, in spite of the loud curses heaped on him by these two, he disappeared into the hole, and when he came out a callow young myna could be seen making ineffectual struggles to escape from the hold of his powerful beak. This horrible sight seemed to gird up the courage of the old mynas, for, as the young one disappeared down the kingfisher's throat, they attacked him in real earnest, whereupon he quickly decamped, his flight still further hastened by a pair of kingcrows who, with all the will in the world, joined forces with the mynas and, unlike these, did not desist from their assaults until the murderer had taken refuge in a tree far from the scene of his crime.

It is said that, failing living young birds, he will content himself with eggs, but I do not know of any authentic account of his eating these, though it is most probable that he does.

It is not at all a shy bird and allows of an easy approach, even after being fired at and missed, flying but a short distance, and when resting is not quickly disturbed.

When employed in its legitimate occupation of fishing, its actions are much the same as those of *Halcyon smyrnensis*, and its flight also is much like that of that bird, though I think that the stork-billed kingfisher may be rather the more rapid flyer of the two under ordinary circumstances, the white-breasted kingfisher, on the other hand, being more active in escaping danger.

Sub-Family *Dacelininæ*.

(446) CEYX TRIDACTYLA.—The Three-toed Kingfisher.

Hume, No. 133.

This little bird is very largely an insect-eater. I met with two birds once inside the forest in the Jetinga Valley, and, having nothing else to do, I sat down quietly under the dark shade of a thick tree and

watched them for some minutes. I repeatedly saw them make a dash into the foliage of the plants round about and then come out and swallow something. I could not make out what they were at the time, but afterwards, when the attention of many leeches made me "move on," I shot one bird and found its stomach full of spiders. Since then I have *seen them catch* spiders, darting at them as they sat in the centre of their webs, and speaking one day about this to Mr. H. A. Hole, he told me that he also had found spiders in their stomachs more than once.

(447) HALCYON SMYRNENSIS.—The White-breasted Kingfisher.

Hume, No. 129.

I must here modify certain of the statements which appeared under my *nom de plume* of "Rekab" in "*The Asian*," or rather not *modify* but add to them.

At the time when I then wrote I had not visited any of the larger streams during the breeding season of this bird.

I have now been down the Diyung several times during early April and, as far as the big rivers are concerned, the eggs of this bird will only be taken between the 25th March and the end of April.

After that date floods are always liable to come down and the bird knows this of course, so that nearly all eggs are laid by the 10th of April. It is possible going down the river, the Diyung, to take as many as forty nests in a day, and I have myself, without hunting for them, taken over twenty.

From this, of course, it will be seen that normally this kingfisher, like all others, makes its burrow in a bank and lays its eggs at the end of it in a chamber. Away from the river, strange as it doubtless seems, it often makes a large wren-like nest of moss, which I described in detail in my old article.

(448) HALCYON CORAMANDA.—The Ruddy Kingfisher.

Hume, No. 131.

A very rare bird in North Cachar.

Its eggs cannot be distinguished from those of *H. smyrnensis* nor its burrow from the normal one of that bird, but it is generally placed in far more secluded spots.

I have seen this bird on tiny streamlets in dark ravines, far from any stream or river other than the trickling one at the bottom of the

nullah. It lives largely, I think, on insects, and perhaps on any tiny reptile which may cross its path. It ascends high up the mountains, for, more than once, have I seen it flash across my path close to Guilang, and though they were but flashes there is no other bird which could possibly be mistaken for it.

I have been told of its having bred at over 4,000 feet, but cannot personally vouch for the truth of this statement.

Order—CORACIÆ.

Family *Cypselidæ*.

Sub-Family *Cypselinæ*.

There are so many gaps in this family as shown merely by their nidification in Hume's "Nests and Eggs" that I think it is better to use the classification of these birds as given in Vol. XVI of the Catalogue of the Birds of the British Museum.

(449) *MICROPUS PACIFICUS*.—The White-rumped Barred Swift.

Hume, No. 101 Bis ; Cat., B. Museum, Vol. XVI, p. 449.

I have seen on two or three occasions large flocks of this fine Swift, but have not had them fly close enough to allow me to obtain any specimens. Hume ("Stray Feathers," Vol. XI, p. 31) records having seen them in Manipur, though he also failed to shoot any, and there is a specimen from Cachar in the Hume Collection in the British Museum.

(450) *MICROPUS AFFINIS*.—The Common Swift.

Hume, No. 100 ; Cat., B. Museum, Vol. XVI, p. 452.

A bird I obtained in the extreme north of the district may be assigned to this species, but is very dark and has a rather longer tail than usual.

(451) *MICROPUS SUBFURCATUS*.—The Eastern Swift.

Hume No. 100 Bis ; Cat., B. Museum, Vol. XVI, p. 456.

This is the common form of Swift everywhere in Cachar except perhaps in the north, where the district meets the valley of the Brahmaputra. Hartert (*Novitates Zoologicæ*, Vol. I, No. 4, p. 674) gives a description of a nest and eggs sent to him from Kuching, Sarawak. This, like those which I have myself seen, resembled the nest of *M. affinis* too closely to require any further description from me, though I may note that they were all attached to buildings exactly in the same manner as are those of that bird. I have not been

able to trace the movements of this bird with any accuracy. Here in North Cachar, where it is confined almost exclusively to the lower valleys, it appears in about March or April and disappears again in August. During May, June and July they are often to be seen in considerable numbers, yet very few breed anywhere in the hills, the few nests which I have seen having been built in the houses of the hill tribes.

In Hailakandy I am informed that the bird appears in April and leaves in June, a few birds being still met with in July. During the first three months it is always to be met with in very great numbers, and they must breed somewhere near at hand ; but I can find out very little about their nesting arrangements.

From a part of the district further north I have received nests and eggs, although the bird is not nearly so common in that direction.

(452) TACHORNIS INFUMATA.—The Palm-roof Swift, or Eastern Palm Swift.

Hume, No. 102 Bis ; Cat., B. Museum, Vol. XVI, p. 468.

Extremely common all over North Cachar and the adjoining districts. I see Hartert gives the dimensions as being very much the same as I did many years ago in the columns of "*The Asian*," when I drew attention to the fact that Oates gives their length as being 5·2", which exceeds greatly in size any bird which I have seen. The probability is, therefore, that his measurements were taken from an unusually large bird.

There are many statements extant about this bird which require either contradiction or explanation, though this is not perhaps the place in which to enter into a discussion.

There is but little on record regarding the breeding habits of this Palm-swift although it is so common, and the nests are so easily obtainable. They are built of down, feathers, and inspissated saliva in the roofs of the Naga huts, not, as Oates says, in those made of palm leaves, but in the ordinary grass-thatched ones. They are fairly large in comparison to the size of the bird, being from 2·5" to 1·5" across the widest part and varying much in depth, according to the angle at which the thatch lies in which they are built. The amount of saliva used is sometimes only sufficient to mass the feathers, down, etc., together, at other times more than half of the nest consists of it.

Hartert (*Cat. loc. cit.*) mentions that this bird sometimes lays three eggs. As he probably says this on the authority of some notes I gave him about seven years ago, I may mention here that three eggs in a nest are quite abnormal though I obtained such two or three times the year before I wrote the notes in question and have this month taken one other.

The birds breed twice in the year, and I have taken nests as early as the 27th January and as late as the 30th September. If the first nest is destroyed, the second contains far less saliva, and being made of more bulky materials, is generally also a good deal larger. They are extremely bold little birds and pass constantly within a few feet, even inches, of the people inside the houses, and when they have fixed on a situation for their nest it is almost impossible to induce them to leave. If a nest and eggs are taken, the birds promptly build another, almost exactly on the same spot from which the other was stolen, and I have heard of their building even a third.

Sub-Family *Chaeturinae*.

(453) *CHÆTURA NUDIPIES*.—The Short-spined Spine-tail.

Hume, No. 96 Bis ; Cat., B. Museum, Vol. XVI, p. 474.

A specimen of this bird was shot by me hawking for insects over a hill close to my bungalow. I took home to England this and some other Spine-tails in order that I might have my identification either confirmed or corrected. On an examination of them by Mr. Hartert and myself at Tring, all proved to be correctly identified, so we have the remarkable fact that three sorts of Spine-tail were all shot in the same place, and this too in a district whence two of the species had not hitherto been recorded.

The wing of my bird (measured from the skin, *not* from life) is only 7.31". The light centre to the back contrasts very strongly with the surrounding glossy dark hue.

The colour of the soft parts are as follows:—Irides, dark brown ; bill, black ; legs, dull dark purple or purplish-lead colour.

(454) *CHÆTURA GIGANTEA*.—The Giant Spine-tail.

Hume, No. 96 Bis ; Cat., B. Museum, Vol. XVI, p. 475.

I have obtained but a single bird of this species, one of a large flock which was hawking over the same bare hill on which I obtained *C. nudipes* and also a few *C. indica*. Probably this bird is as common

in North Cachar as is the next, for the natives of one tribe (the Mikirs) call the white-spotted birds the female and those with unicoloured lores the male.

The wings are said by Hartert to average somewhat longer than those of *C. gigantea*, but the single specimen I have measures only 7·86" as against 8·19", 8·19", 7·9", and 7·7", the measurements of four birds which I possess of the next species.

The chin in my specimen is no paler than in many specimens of *C. indica*, indeed not so pale as it is in a few; there are also faint indications of a white spot in front of the eye, but the back is extremely dark.

The difference in newly-feathered birds and those about to moult is very striking, the former having rich brown plumage much glossed, whilst the latter are almost glossless, and the brown colour becomes of a very dull dead shade. In new feathers the white edging to the terminal portions of the tertiaries is very distinct.

(455) CHÆTURA INDICA.—The Indian Giant Spine-tail.

Hume, No. 96 ; Cat., B. Museum, Vol. XVI, p. 475.

I believe there is nothing on record about the nidification of this bird except the few notes which I published some five years ago in "*The Asian*."

The place where I found that this bird is in the habit of breeding is called "The Hot Springs," and is situated about a quarter of a mile from the Kopili, which here forms the boundary between the North Cachar Subdivision and the Khasia Hills.

All about this part of the country there are numerous very old deserted lime quarries; most of these lie in the pockets between the hills and generally consist of small deep valleys, further split up into narrow ravines, the work of nature and man combined. The sides of these ravines are always very steep and often consist of sheer perpendicular walls of limestone, over which the trees hang in dense masses, in places shutting out the light and everywhere rendering them very dark and gloomy. Here and there, however, the sides have fallen in, forming passages by which the bears, who inhabit these places, easily ascend or descend to their caves. In many places these ravines run along parallel with one another for some distance, hardly 20 feet apart, sometimes even less, and it is here that the work of man is most

evident, for the quarrymen, whoever they may have been, have bored numerous connecting tunnels through the dividing rock and limestone. In shape these passages are nearly all semi-circular arcs, in height and breadth varying from less than five feet to more than fifteen. Originally the walls and ground were most probably quite smooth, but the bears have torn up the former and time has roughened them both and added short stalagmites and stalactites in patches everywhere.

One year, on the 26th of April, I had been searching several of these quarries for bear, and had succeeded in shooting one of a pair which were seated in a little cave. The one I fired at never moved after receiving the shot, but the other one scrambled off to a cave still lower down, and either her movements or the report of the gun disturbed a pair of birds which I at once recognized as Spine-tails of some kind, but, having the bear still to look after, I could not then pay them any attention. I finally killed the bear in a short, very high tunnel between two ravines which were about twenty feet deep by about half that in width. In this place we again saw two or three of these birds as they flashed past us whilst we were examining the bear, but not for a moment did it enter my head that they were breeding anywhere near. On the 28th, however, I revisited the spot, and failing to find any bears, my Cachari attendant and I had ample opportunities to take a good look round. In one corner was a large mass of moss laid out so as to form a couch, yet warm from where a bear had been lying on it, and behind this was a shallow cave where Mrs. B. had most likely raised her last family ; signs everywhere showing that the tunnel and caves in it were the country residences of a party of bears, in all probability the bears I had shot and their cubs. I was leaving this place, when my notice was attracted to a patch of dull green which contrasted with the dirty white colour of the wall, and which closer examination proved to be a nest. It was not easy to get at, and the Cachari not being strong enough to hold me on his shoulders, I had to let him mount on mine and try to get down the nest with a crooked stick. We were, despite our best efforts, quite unable to succeed in this, so we turned our attention elsewhere, and were fortunate enough to find two more nests in the same cave and which, with a little trouble, we were able to take.

They were composed almost entirely of the moss of which the bears had made their couch, much matted and pressed together with mud. That the makers of the nests *had* taken the bear's moss and had not themselves collected fresh material we could easily tell by the presence of the numerous long black bear's hairs which had adhered to the moss and had been taken up with it.

In shape the nests were large, shallow, oval cups of which the rock formed the back wall. The other three sides were about an inch in breadth at the top gradually increasing towards the base, where there was a quantity of loosely matted moss, twisted and bound *into* the nest itself as well as wound all round and twisted into the rough splinter of rock on which it rested. In one nest the bottom was about an inch and a half in depth, in the other it was less than an inch deep. The nests were ones from which the young had recently flown, but there was no lining in them beyond a few loose pieces of moss.

The measurement of the two nests were taken on the spot and were as follows :—

Length of exterior oval	...	5·8" and 6·3".
Breadth of do. do.	...	3·5" and 3·7".
Length of interior do.	...	4·1" and 4·5".
Breadth of do. do.	...	2·6" and 2·95".
Depth of exterior do.	...	1·8" and 2·3".
Do. of interior do.	...	·9" and ·8".

Besides these nests there had been others in the cave, their sites still shown by the patches of mud and moss which adhered to the walls. There were no signs either of eggs or young birds in this cave, nor were there any old birds flying about it on the 28th; but a cave visited after we left the first produced better results. In the first and second nests we found nothing, but in the third we found three fully fledged young ones almost ready to fly. These young were like the adult birds, but the spines on the rectrices were very soft, the loreal white spot was hardly defined, and the white band next the rump almost imperceptible.

I searched all round about most carefully for fragments of eggs though with but little hope of finding any; for I expected that these birds, like others of the family, would probably carry them to some distance from the nest. I was quite unsuccessful myself, but the

Cachari, luckier than I, in a crevice below one of the nests, found an exceptionally large bit consisting of more than one-third of what had been the large end of an egg. It was pure white, dull from the effects of time and much discoloured and stained, but was easily cleaned. It did not appear ever to have had the slightest gloss on it, nor was the shell at all fine or close in grain. In texture it much reminded me of the eggs of the smaller Barbets, especially *X. hæmatacephala*, and like the eggs of that bird were rather soft and brittle.

Supposing it to have been of the usual, rather lengthened, shape of the normal egg of the family, I should judge it to have been much about the same size as the average egg of *Pomaterhinus ferruginosus*, that is to say, about .85" in length, whilst the breadth of the egg is shown to be just .61", the portion in my possession containing the broadest part.

During the heat of the day this bird is not often visible, generally retiring somewhere (? where) after 10 a.m. or so, not to re-appear until the cool of the afternoon, unless it is cloudy and about to rain, when they are almost sure to put in an appearance.

They are certainly not common in these hills, and there are but few places where they may be met with any certainty ; but there are generally a few on the lower stretches of the Diyung and Kopili Rivers, and there is a roosting place in some limestone caves near the quarries already mentioned.

I once had an admirable demonstration of the speed of these birds. I was watching a great number of *Tachornis infumata* hawking over one of the small feeder streams of the Diyung and two or three pairs of *Chactura* were also rushing up and down with incredible swiftness. Presently a small hawk, most probably *Accipiter virgatus*, appeared on the scene and perched on a lofty tree beside the stream, whence he made several dashes at the smaller swifts, eventually catching one of them. He then attempted higher game, darting out at the Spine-tails as they approached his seat, but by the time he had risen to the height at which the Spine-tails were flying, the latter had passed by and were already nearly out of sight.

The sparrow-hawk only tried this game twice, and then realized the utter fruitlessness of his efforts and returned to his original game.

The cry of this bird is very swift-like, but is loud and extremely shrill.

Its flight is almost as noticeable for its singular steadiness and little wing movement as it is for its great swiftness.

(456) *CHETURA LEUCOPYGIALIS*.—The Small Black Spine-tail.

Hume, No. 95, Bis ; Cat., B. Museum, Vol. XVI, p. 490.

I have twice seen a small Spine-tail hawking about over the Mahor River, but missed the only possible shot I ever had. There was no white visible as the birds flew overhead, so that it could not have been *C. sylvatica* and not being that bird, it is practically certain it must have been *C. leucopygialis*.

(457) *COLLOCALIA FUCIPHAGA*.—(Subspecies *C. f. brevirostris*?).

The Northern Swiftlet.

Hume, No. 103, A ; Cat., B. Museum, Vol. XVI, pp. 549-501.

Many years ago a *Collocalia*, together with its nest and eggs, was brought to me by some Nagas. This bird I then identified as *C. linchi*; then afterwards I found that this *must* be wrong and thought that it was possible that they were *Spodiopyga*, but as I had no skins to compare them with and knew but little of the genus, I was wrong again, and now I think I can say with fair certainty that the bird was Hume's Manipur bird.

It is undoubtedly very rare, but I may have mistaken it for *C. infumatus* on some occasions.

(458) *MACROPTERYX CORONATA*.—The Crested Tree Swift.

Hume, No. 104 ; Cat., B. Museum, Vol. XVI, p. 512.

My experience of the nidification of this bird has been rather remarkable. It is well known that this genus builds a tiny nest of inspissated saliva which is generally placed on the upper surface of a stout bough; now, strange to say, the North Cachar bird not only builds an unusually large nest, but more often than not places it *against the side of the bough*.

The first nest I ever took was a most peculiar one, and, judging from its construction, must have been the second built by the bird that season. I found it on the 12th February, 1887, built against the trunk of a large tree just above a large bulging knot, some forty to fifty feet from the ground. It was made of seed down, a few tiny scraps of bark, and also three or four comparatively large bunches of moss. These were massed together, with the exception of the bark, into a solid mass with saliva, forming a very substantial little nest, the

walls only at the very edge alone being of the usual thin character. In its greater external length the nest was so less than two inches, and it stood out from the tree rather less than an inch and-a-half. Externally it was nearly two inches in depth, the nest running down the tree in a kind of irregular cone with the base reversed. Inside, it was less than half an inch in depth.

They breed principally in December and January. It is a most interesting sight to watch them retiring to roost. Just after sunset one hears a harsh scream overhead, then another, and another, as one by one the birds collect. On arriving at their proposed roosting place, they fly round and round, gradually lowering their flight until one bird suddenly makes a swoop and settles on some part of the tree near the top. This is the signal for the rest to perch, and in a few minutes they are all dotted about the higher branches. In a few minutes they begin to close up with the bird which first alighted on the tree, finally collecting in a feathery ball, one on the top of the other. The first attempt is, however, very seldom satisfactory, and abruptly scattering the whole performance is again gone through ; sometimes this occurs three or four times before they get settled, but at last the twittering stops, and they are asleep for the night. It is wonderful how compactly these birds close up ; a flock of eleven appeared not to take up a space more than a foot long by about half as broad.

Any one who knows *Artamus fuscus* (or any other Swallow-shrike) well, will notice at once that the above notes on the roosting of the Swifts would equally apply to that bird ; there is, however, a very great difference in the speed at which the two birds fly ; and again whereas *Artamus fuscus* collects in flocks, sometimes numbering over a hundred, those of *M. coronata* will seldom be over a dozen or so. I have spoken above of a flock of eleven, and of these six were shot, five of the birds proving to be males and one an immature female. As they were shot in January, this would seem to prove that the female must have been a bird of the season hatched elsewhere, and that this Swift has two broods and visits two breeding places in the year. It would appear that the adult breeding males collect together to roost, leaving their better halves to perform the duties of incubation during the night.

Hume ("Stray Feathers," Vol. XI, page 33), remarks that it is strange that this bird should not be found in any of the hills round

about Manipur, and doubtless it is to be met with, for in North Cachar, though decidedly rare, I seldom pass a year without seeing it, though during the last two years this has not been the case. It appears to be partially migratory, if not wholly so in these hills, as from June to November I have never seen it.

Family *Podargidæ*.

Sub-Family *Podarginæ*.

(459) *BATRACHASTOMUS HODGSONI*.—Hodgson's Frogmouth.

Hume, No. 100 ; Cat., B. Museum, Vol. XVI, p. 642.

Hume has given the colours of the soft parts of a female, so I give here those of the male, noted down from a live bird. Irides pale, bright hazel yellow ; bill dirty horny yellow, lighter below, with the tip and commissure dusky black ; legs pale pinkish, flesh colour ; claws black. Some of the frontal plume shafts are $1\frac{1}{2}$ " long. The bird from which these details were taken was caught whilst incubating two eggs on its nest.

An almost fully-fledged nestling, one well able to fly, differed a good deal in plumage from the adult bird. The upper plumage was like that of the adult but less bright, with finer and more numerous vermiculations, and the whole tone more truly grey. Below, the beautiful pink tinge is quite absent, the colour being a dead white with narrow bars of brown, very numerous on the upper breast, less so considerably on the lower breast, abdomen and flanks, though slightly broader on all these parts.

The whole aspect of the bird gives a grey tone without any tinge of rufous in it.

Irides brown ; feet dark flesh-colour ; soles slightly paler, and the claws blackish-horny ; bill horny-grey tinged with pink above and darkest at the base of the culmen ; eyelids livid flesh-colour or livid pink.

The bill is covered with the same rough scaly substance as it is in the adult bird, but the long frontal shafts are not developed, and there are practically no signs of them.

Wing 3·4" ; tail 2·2".

This young bird and the adult male were both knocked over with a stone by a small Naga boy, unfortunately the former being too much torn to allow of its being skinned.

This is not a very rare species in North Cachar, but I have seen more nests and eggs than I have obtained birds, as it is even more nocturnal than crepuscular in its habits and, moreover, lives much in the interior of evergreen forests. It is found from the plains up to five or six thousand feet.

On the 24th of March, 1889, I took my first personally identified nest of this bird, and since then I have secured nearly a dozen. All nests are of the same type, *viz.*, pads formed of down, taken apparently from the bird itself, and then completed by having the outside covered with bits of bark and lichen in such proportions as may be required to make the nest resemble the branch on which it rests. As a rule, rather a stout bough is selected, in which case the materials of the nest only cover the upper portion; but where a smaller branch is chosen, the materials often entirely surround it. The size of the nests vary considerably, and I have taken them as large as 3·2 inches in diameter and as small as 2·1 inches, but the average-sized nest is rather under 3 inches. In the same way though the nest is always of extreme toughness and clings to the bough with great tenacity, yet there is a wide difference in the substantiality of different specimens. Two nests taken by me measured as follows :—

1. A very stout little nest built on a narrow branch of a wild cardamom. Diameters, externally 2·35" \times 2·46"; internal diameter, 1·36"; depth of materials where they surround the branch, 1·65"; internal depth of hollow, .5". The depth of the base where resting on the branch is about .2", but the materials are exceedingly compactly woven.

2. A thin, rather large, nest built on a biggish bough. External diameter 3·2" \times 3"; internal diameter 2·1"; depth of materials, very straggly, 1·41"; internal depth .4". Depth of base, well under .1", and in many places it can be seen through. In spite of its flimsy appearance, even this nest is very strong and would require no little force to tear it from the bough to which it is fastened. In general texture all nests are like soft, stout, and very flexible felt.

The nests are seldom built at any height from the ground, generally between 6 and 12 feet, sometimes lower than the former height; never, I believe, above the latter. Most of the nests have been found on stoutish branches of small trees and may be placed either close to some upright branch or well away from all support but

the one branch on which it rests. On one occasion only have I taken the nest from a fork and then it was a stout, very wide-spreading one. The earliest nest I have recorded is the 23rd March, 1889, and the latest the 23rd August, 1891, both containing eggs, so that it would appear that the breeding season is very extended. At the same time I must record that of all my nests of this genus—13 all together—11 were taken either in late March or early April. In the latter month of 1893 I took no less than five nests containing eggs.

These latter are usually two in number, rarely only one, and they are all wonderfully alike in size and exactly alike in shape.

I am sorry to say that several eggs which I have given away I omitted to measure, but the rest measure as follows:—

- (1) $1\cdot12'' \times \cdot71''$
- (2a) $1\cdot07'' \times \cdot73''$
- (2b) $1\cdot08'' \times \cdot73''$
- (3a) $1\cdot10'' \times \cdot69''$
- (3b) $1\cdot12'' \times \cdot69''$
- (4) $1\cdot09'' \times \cdot68''$
- (5a) $1\cdot11'' \times \cdot70''$
- (5b) $1\cdot12'' \times \cdot70''$
- (6a) $1\cdot09'' \times \cdot68''$
- (6b) $1\cdot09'' \times \cdot68''$

That is to say, they vary in length between $1\cdot07''$ and $1\cdot12''$ and in breadth between $\cdot68''$ and $\cdot73''$; besides these I have one abnormally broad egg which measures $\cdot79''$ in breadth. The average of the ten eggs is $1\cdot10'' \times \cdot70''$ about. In shape they are perfect ovals, one egg only, amongst all that I have taken, being somewhat pointed at one end.

They are, of course, pure white like the eggs of all the genus, and in texture they are much like the barbet's eggs, *i.e.*, beautifully smooth and with a satiny feel to the touch, but at the same time without gloss. They are very fragile.

Family *Caprimulgidae*.

Sub-Family *Caprimulginae*.

(460) CAPRIMULGUS ALBONONOTUS.—The large Jungle Night-jar.

Hume, No. 109; Cat., B. Museum, Vol. XVI, p. 540.

Hartert gives this form only a subspecific value, and he is undoubtedly right, although the two types are both met with in North Cachar.

This, the larger form, is exceedingly common all over these hills, but more especially so in the immediate vicinity of my bungalow, so that I have had exceptional advantages in watching their habits and movements.

My house is built on a hill, the garden on the steepest side coming up to the very brow of the steep, almost precipitous grass slope, leaving room only for a narrow footpath for the servants and hill people just outside the fence. This pathway is the favorite haunt after dusk of this fine Night-jar, and I, seated motionless on the bank, often have had them approach me within a few feet, so near indeed that I have more than once tried to catch them with a short butterfly net. I believe it is not at all generally known how much these birds feed on the ground, but I have constantly observed them so feeding, and butterflies or other dead *large* insects which were placed near their favourite resting-places were greedily eaten by them. Their movements on the ground are stronger and quicker than might be expected judging from the formation of their feet, and they *run* in exactly the same manner as do martins and swallows when collecting mud for their nests.

A very remarkable trait in this bird is the fact that the female will accept the advances of more than one male; but remarkable as it is it is undoubtedly the fact, for on one occasion I was a witness of it nor could there be any mistake, for both males were present at the same time and within three yards of me.

The actions of the young are very peculiar; tiny mites, still blind—their eyes do not seem to open until the seventh day—will, when first discovered or when they hear a heavy tread near them, lie flat on the ground, their colour closely assimilating with the dead bamboo leaves or other material on which they lie; should, however, the danger of discovery become very imminent, they will crawl under the leaves and hide from sight altogether.

(461) CAPRIMULGUS MONTICOLA.—Franklin's Night-jar.

Hume, No. 114; *Cat.*, *B. Museum*, Vol. XVI, p. 549.

Rare everywhere and more so in the hills than in the plains.

(462) CAPRIMULGUS JOTAKA.—The Japanese Night-jar.

Hume, No. 107, *Bis*; *Cat.*, *B. Museum*, Vol. XVI, p. 552.

I have only seen specimens of this form from the plains, never, as far as I can remember, from any height over some 500 or 400 feet.

Mr. H. A. Hole found it breeding at the foot of the North Cachar Hills near Jellalpur.

(463) *CAPRIMULGUS MACRURUS*.—The Malay Night-jar.

Hume, No. 110; Cat., B. Museum, Vol. XVI, p. 539.

I have seen two or three specimens of this Night-jar, but it is, I fancy, a rare form.

(464) *CAPRIMULGUS ASIATICUS*.—The Common Indian Night-jar.

Hume, No. 112; Cat., B. Museum, Vol. XVI, p. 558.

I have but two birds of this species, both shot whilst hawking over the Diyung River at an altitude of some six hundred feet.

(465) *LYNCORNIS CERVINICEPS*.—The Burmese Eared Night-jar.

Hume, No. 114, Bis; Cat., B. Museum, Vol. XVI, p. 604.

This lovely Night-jar does not appear very rare to the extreme south of the district, but is extremely so in North Cachar, and all but three of the specimens in my collection were obtained by Mr. Charles Inglis, of Hailakandy. I have seen it a few times in the Mahor Valley and once at Haflang, over 2,000 feet high. It extends into Assam.

Family *Coraciidæ*.

(466) *CORACIUS AFFINIS*.—The Burmese Roller.

Hume, No. 124.

Common everywhere. Its nidification is in every respect like that of *C. indica*.

(467) *EURYSTOMUS ORIENTALIS*.—The Broad-billed Roller.

Hume, No. 126.

Not a rare bird, still not a common one, and so exceedingly cute that it is with the utmost difficulty that one ever gets a shot at it.

The bird seems to have one stereotyped position for its nest as regards North Cachar, nearly all those I have seen having been placed in holes in *Bombax* trees at very great heights from the ground. These holes, too, are nearly always in abnormally swollen pieces of bough, which swellings are caused by some disease which also renders them hollow. By selecting such places the bird obtains sites far higher and safer than it could anyhow else.

It has been with the greatest difficulty that I have succeeded in having three nests got at, and the eggs I possess measure $1.57'' \times 1.15''$; $1.54'' \times 1.18''$; $1.53'' \times 1.16''$; and $1.32'' \times 1.03''$.

Family *Meropidae*.

(468) NYCTIORNIS ATHERTONI.—The Blue-bearded Bee-eater.

Hume, No. 122.

The burrows made by this bird may be met with in the cuttings of nearly every road in North Cachar, no matter what the elevation may be, and, as far as I can make out, all the year round newly-made ones may be found with a little trouble, for, when not breeding, this species appears to amuse itself in burrowing places merely to use as sleeping accommodation, and for this purpose to require a new hole every few weeks. To find a nest-hole containing either eggs or young is a very different matter, and this may cost the collector both time and trouble, more especially as little reliance can be placed on their time of breeding. Thus in March, 1890, early in the month, I observed one of these birds about some holes in a roadside bank and, after investigating the interior of several of these with a long twig, found the one in which was the nest. Early as it was in the year the twig dragged from the chamber at the end of the hole a mass of beetle wings, &c., showing that it had been occupied some time, so that I expected to find the eggs all laid, if not partially incubated. When the chamber, however, was arrived at, after a long time occupied in digging, it was found to be empty, the young being hatched, fledged and departed two or three days previously. Another time, late in June I obtained a single egg quite fresh, and two days after this opened another burrow in which the eggs had not then been laid. Most birds will be found breeding between early March and the beginning of May. A good way of ascertaining whether there is any chance of getting eggs out of the burrow is to insert a very long elastic twig into it, first having tied the end into a small loop. This should be pushed in with the tip pressing against the roof, so that no egg, should there be any, may be injured and, when the end of the burrow is reached, dropped and then slowly and gently dragged out. If no bees' wings, beetles' legs or similar remains are produced, it may be taken as very nearly certain that the eggs are not yet laid, for the parent-birds seem to have a habit of devouring their prey inside the burrow, and by the time the eggs are all laid there is always a quantity of these remnants, increasing greatly, of course, in amount as the young are hatched and also have to be fed. As a rule, in old burrows, or by the time the young are fairly old, there

is a very fetid smell about the nests which will warn any one against uselessly expending energy and time in such cases. The length of the burrows seems to vary from three feet to seven, or even more when the ground is very soft and sandy.

I believe five is the full number of eggs laid, but have been so unfortunate in obtaining eggs that I cannot be at all sure. I took five just showing signs of incubation, though very slightly, in April, 1892, and saw five very hard set.

In December, 1893, I found this bird haunting a dead tree beside a road some five miles from Gunjong. The two birds were so constantly about this tree and always in and out of a large hole in it that I am sure they intended to lay their eggs in it, though I had unfortunately to leave the district before I could ascertain the fact for certain. This species has always been supposed to breed in trees, but I had hitherto doubted their so doing. Major Bingham once saw a bird fly out of a hole in a tree, but there were no eggs or young in it, and the chips and feathers he *did* find *might* have belonged to some other bird, and this I was the more inclined to believe was the case in that in November, 1892, I shot a bird which flew out of a large hollow in a cotton-tree whose stomach was full of lice and similar insects, such as would have to be sought for in holes, crevices, etc.

The eggs, of which I have only seen eleven, are not to be distinguished, *when taken*, in any way from those of *Halcyon smyrnensis*, unless perhaps they are very slightly less glossy. After they have been kept some time, they lose their polished appearance far more than the kingfisher's eggs do, and those taken by me in April, 1892, are much less glossy than some of the latter bird's eggs more than twice as old.

The texture is not quite so compact as in the eggs of *H. smyrnensis*, and ink soon soaks into the shell if it is written on. They are in shape just the same as are all the eggs of bee-eaters, and the average of seven is $1.22'' \times 1.07''$, the length varying between $1.08''$ and $1.32''$ and the breadth between $1.02''$ and $1.12''$.

This bird is to be found in small numbers over nearly the whole of Cachar, though it is rare in the plains, and nowhere is it as numerous as the great number of burrows met with would seem to indicate. As a rule it is either solitary or keeps in pairs, but now and then four or five congregate together, though it is doubtful if these flocks keep in

company for any length of time. It feeds far less on the wing than most of the members of the *Meropidae*, frequenting high trees and searching the leaves and flowers for insects. The cotton-tree, when in bloom, is a very favourite resort of these birds, and when on these they devote their attentions entirely to the open flowers, not once in one hour pursuing any insect on the wing. They are shy birds as a rule, and are not easy to approach, though sometimes one, out of sheer stupidity, will sit and croak whilst a looker-on is within a few yards of it.

Their note is a very harsh double croak ending in a chuckle, and is one which once heard cannot afterwards be mistaken for any other bird's cry. When uttering this note, the bird stoops down until its head is lower than its tail, puffs out its throat and gives vent to the first croak; then, rising gradually, it chuckles out the last notes with head high in the air.

The whole of the movements of this bird on the wing are far less light and rapid than those of the genus *Merops*; still they are not ungraceful. Scrambling about on a tree, however, all its actions are decidedly heavy and awkward, and the way it shifts itself sideways along a branch, bobbing at every step, and appearing rather doubtful about its balance, is very ludicrous.

(469) *MEROPS VIRIDIS*.—The Green Bee-eater.

Hume, No. 117.

Not uncommon in the plains, but does not ascend the hills beyond the foot.

(470) *MEROPS PHILLIPINUS*.—The Blue-tailed Bee-eater.

Hume, No. 118.

I have only met with this bird once in N. Cachar, but have seen skins collected in Cachar.

(471) *MELITTOPHAGUS QUINTICOLOR*.—The Chestnut-headed Bee-eater.

Hume, No. 119.

Non-adult birds have the rufous and black band very indistinctly defined, and have the head, from the forehead to the nape, of the same colour as the wing-coverts; the rufous of the back is also much mixed with green. The irides are the same as in the female.

Like all the bee-eaters, of which the nidification is well known, these birds lay their eggs in a chamber placed at the extremity of a tunnel

varying in length according to the soil in which it is dug. Thus, in sandy soil, the bird will burrow deeper than any of the kingfishers, and I have seen tunnels over ten feet in length, though, as a rule, they do not much exceed five or six. In earth or clay they seldom go to a greater depth than two or three feet, and one I found, which had been dug in stiff clay, was barely 10 inches deep,—that is to say the tunnel itself was not more than a couple of inches, and then came the egg-chamber. The tunnel varies in breadth (I have not measured many) between 1·9" and 2·3", the greater number being just about half-way between these two extremes. The place which is excavated for the reception of the eggs is generally about 8" long by 6" broad and rather less in height; there is no lining of any sort placed in it, nor is there the mass of beetles' and flies' wings, &c., which is so invariably found in the nests of *Nyctiornis athertoni*.

The majority of birds here breed in the banks of the Diyung River, and during April and the first few days of May as many as twenty nests may be taken in a day, although I have never found them breeding in company as they do in many other localities. Once or twice I have found two birds breeding close together, but never, to my recollection, have I seen three in the same place.

Queer places are sometimes selected by this bird in which to make its burrow. I was once (in April, 1889) walking along a sandy chur, which was almost a dead level over its greater extent, when the sand gave way beneath my foot, and, on raising it, a bee-eater flew out of the break I had made. Examining the ground, I found that the birds had dug down into it for about a foot and had then made a long tunnel just under the surface of the sand, and it was this which had caused it to give way under my feet. The chamber contained six fresh eggs which I left untouched, as I had already as many as I could carry, and before leaving I had the pleasure of seeing both birds return to the nest. The same day that this happened I found two burrows made in a sloping shelf of sand, which both ran downwards so directly that they almost reached the level of the water, and a rise of a few inches in the river or a heavy shower would have drowned out the owners. I believe the full complement of eggs is six, and I have seldom taken smaller clutches of incubated eggs and never less than four. They are typical bee-eater's eggs, almost spherical,

with very hard, close and glossy shells. Abnormally shaped eggs are rare, and amongst over 200 that I have taken I do not think I have seen a dozen such. Those I have seen were generally long, regular ovals, and I have only come across one incomplete clutch of three eggs which were of the pointed oval shape said by Theobald to be their typical character (Oates', Humes' "Nests and Eggs," &c.) The average of 200 eggs is .86" by .76", and they vary in length between .81" and .93" and in breadth between .71" and .81". These details coincide wonderfully well with those given by Oates, and show how closely, in a large series of eggs, the average sizes agree.

The birds who build in the banks of large rivers, streams, &c., generally commence excavating their burrows in the last few days of March, and by the 10th of April most have laid their eggs. By large streams and waters liable to be flooded I have never taken eggs except between the 1st and 28th of April, and those taken on the latter date were almost ready to hatch; in other situations I have taken their eggs as late as the 28th of June, though this was an exceptionally late clutch, and I expect belonged to birds which had come to grief over their first attempt to bring up a brood.

I believe the eggs only take from seven to nine days to hatch, and the young birds are able to leave their nest far more quickly than most. This rapid incubation of the eggs and quick growth of the young bird's plumage is a very necessary gift of Providence, for, were it not so, innumerable young ones would be drowned in the first few floods which come down at the end of May. As it is, an unusually early rainy season destroys countless eggs and young, and the whole labour of excavating, incubating, and rearing of the young has to be once more undertaken, so that in such a season the eggs may be found until a very late date. Thus in 1892 the heavy floods of March and April destroyed all the river nests, and the birds were driven to breed inland, and I found them so breeding in May and early June, taking their eggs, as already remarked, as late as the 28th of the latter month. On the 14th of this same month I shot some birds of the year which were hawking for insects with many other adult birds.

These birds are very close sitters, and one or other of the pair is on the nest nearly all day, and during the night both birds sleep in the egg-chamber. They are very early risers, and even before the crow has

begun to clear his throat or the myna to sing his morning comic song the bee-eater is up and uttering his shrill, musical trill as he sweeps round in graceful circles after his game. They almost invariably hunt in flocks, though these may be widely scattered, but I have once or twice seen a pair of these birds with no others near them. They always perch fairly high up, unless feeding over water, and they take constant short flights, either sailing round in circles with wings outspread or hastily following some winged article of food. When they are feeding over a stream or other piece of water, they frequently rest at intervals on the ekra or long grasses which grow beside it, and thence, sweeping low over the water, they capture the gnats and other insects which hover about just over the surface. They drink whilst on the wing by stooping down in the way swallows do, but they make far more fuss over the operation than do the latter birds.

I once saw several of these birds constantly swooping down to a piece of shallow, stagnant water left by the drying up of a stream. I could find no fish fry or other objects in the water, and I think they must have been feeding on the larvæ and eggs of mosquitoes, &c., which floated about in small patches on the top. I had no gun with me at the time, so I could not shoot any in order to examine the stomachs.

I have known this bird to capture and devour the large blue dragon-fly—a feat which shows it to be capable of great speed and activity on the wing.

It is by no means a shy bird, and I have once shot four birds and missed two others from the same flock before it finally went away.

It is found up to the highest altitudes, but is not common above 4,000 feet, and does not breed here above 2,500 feet, more on account probably of a want of suitable places than for any other reason.

Order—BUCEROTIDES.

Family *Bucerotidæ*.

(472) DISCHOCEROS BICORNIS.—The Great Pied Hornbill.

Hume, No. 140 and 140 Bis.

Common in the hills and plains alike.

(473) ANTHROCOCEROS ALBIROSTRIS.—The Small Pied Hornbill.

Hume, Cat., No. 142.

Very common. They go about in flocks sometimes numbering over twenty.

(474) *ANORRHINUS AUSTENI*.—Austen's Hornbill.*Hume, Cat., No. 144 Ter.*

There is but one place in these hills where this bird may be met with almost to a certainty, and this is the lower half of the Jetinga Valley. In this valley a European bird-skinner of mine shot a bird of this species, but the careless fool placed the skin on a low machan during the night and the rats got at it and ate off the feet and also part of one of the shoulders of the wings. This bird was one of a flock of five, and the collector informed me cheerfully "Oh ! I didn't know they were any good, or I should have shot all of them; they *wouldn't* go away." Most probably, however, he was lying, as all I have seen of this bird leads me to believe that they are the wildest of all this shy family. I have often seen flocks and even more frequently heard of them, but never yet have I got within shot, and the only other bird I have ever handled was a female caught on her nest. This nest was taken within half a mile of Gunjong, and the birds must therefore have constantly been within *sound* of my bungalow had they been as noisy as usual, but I never heard their unmistakable trumpet-like call, so that I presume when breeding they discard their usual noisy habits.

The nest was found quite by accident ; I was wandering up a small nullah looking for a Forktail's nest, but came to the end of it without having found anything ; at the top of this nullah was a grass-covered hill and, as I came through the last bushes in it, I saw through the twigs and branches a bird, which looked like a hornbill of some kind, fly from the dead stump of a tree out in the open. Going up to this, I soon spotted the hole, one some twenty feet up, and presently I saw the hen-bird put out her bill for an inch or two.

I could not however tell what kind of bird it was, or most assuredly I would have waited long in the hopes of getting a shot at the male. As it was, I sent the Nagar who was with me up the tree, and he, breaking open the entrance, seized the bird and brought her down to me, when, to my delight, I found that it was *A. austeni*, not as I had expected a Common Pied Hornbill. Giving the bird to me to hold, he then returned for the egg, on getting which, he took charge of the bird and I took the egg. Would that I had never changed, for no sooner did I do so than "Ghajaiba," the Nagar, placed his burden on the ground and went to fetch his *dao*, which weapon

he had left by the tree ; immediately, however, his back was turned, the bird, which looked too tattered and weak to *walk*, flew off. It settled again about 100 yards off for a few seconds and then went right away, and, though I haunted that nullah for days, I never saw either male or female again.

The entrance to the hollow of this nest was only very partially blocked, and the material seemed to be far less cement-like and hard than that used by most hornbills, for the Naga chipped it off with his fingers. The entrance was large enough for the bird's whole head to come out.

The natural hollow inside was a large, but rather shallow, one extending about a foot both above and below the entrance.

The egg is just like that of *Anthroceros*, perhaps a trifle larger than most. Although quite fresh when taken, it is a dull brown-fawn, in colour not unlike a very dirty Brahmaputra fowl's egg ; it is densely covered with very minute pits, and the texture is much coarser than any eggs which I have of *Anthroceros*. It measures 1·87" by 1·374", and is in shape a very regular oval, *very* slightly pointed at the smaller end. It was taken on 19th May, 1893. The cry of this bird is very different to that of the other birds of the family, and I can think of nothing which it resembles more than a subdued trumpet of a peafowl, with variations of the usual cacklings and shrieks of the family, all of which, though loud and resonant, sound to me less harsh than usual.

In addition to the Jetinga Valley, where it may nearly always be met with, and Gunjong, where I have seen it as noted, I have met with it on the Barail range overlooking the Jetinga at a height of about 3,400 feet.

(475) *ACEROS NEPALENSIS*.—The Rufous-necked Hornbill.

Hume, No. 146.

The only egg I now have of this bird is 2·92" by 1·93", but I have sent away a good many, none of which were anything like as small as those mentioned in Hume's "Nests and Eggs," which are, I should say, quite abnormal.

It breeds here only, as far as I know, at considerable elevations, all my eggs having been taken from trees over 3,000 feet up. It is by no means rare above this height, and may also be met with right down to the plains. The noise made by this bird in flying is nearly, if not quite, as loud as that made by *Dischoceros bicornis*.

- (476) *BHYTIDOCEROS UNDULATUS*.—The (Malayan) Wreathed Hornbill.
Hume, No. 145 Bis.

This bird extends from the plains to the summit of the highest hills, but, unlike the other hornbills, the lower one gets the more often one meets with it.

It is often captured by the natives of Cachar, and I have several times seen it hawked round the station for sale, its meat being supposed to have very good medicinal properties. I once bought a pair alive in most perfect condition, the female with a wing broken, for two rupees eight annas, but I was busy at the time with other work and could not take the birds home, so the seller decamped with the birds and their price as well.

My hornbill's eggs have suffered rather badly during my absence in England, and I have now only one perfect specimen left of this species; this measures $2\cdot48'' \times 1\cdot75''$; the pair to it, which is much smashed, is approximately $2\cdot43'' \times 1\cdot70''$.

Other eggs measure $2\cdot52'' \times 1\cdot84''$; $2\cdot36'' \times 1\cdot08''$; and $2\cdot39'' \times 1\cdot69''$; $2\cdot64'' \times 1\cdot90''$ and $2\cdot61'' \times 1\cdot88''$. I have taken their eggs in April, May and June.

Order PSITTACI.

Family *Psittacidae*.

- (477) *PALÆORNIS INDOBURMANICUS*.—The Eastern Rose-band Paroquet.
Hume, No. 147 Quat.

Exceedingly common in Cachar, less so in North Cachar, where, however, flocks are met with up to about 2,500 feet.

I have but three eggs of this species, and these measure $1\cdot31'' \times 1\cdot02''$; $1\cdot30'' \times 1\cdot01''$ and $1\cdot32'' \times 1\cdot04''$. They were taken on the 14th of March, an unusually late date on which to find eggs, most being hatched and the young birds well forward by this date.

- (478) *PALÆORNIS TORQUATA*.—The Rose-ringed Paroquet.
Hume, No. 148.

A rather common bird, but more so in the plains than up above.

- (479) *PALÆORNIS CYANOCEPHALUS*.—The Eastern Rose-headed Paroquet.
Hume, No. 149 Bis.

This parrot is now named *P. rosa*, and the Western form takes the name of *P. cyanocephalus*—*vide* "Salvadori," Cat., British Museum, Vol. XX, pp. 448-453.

This is the most numerous of the Paroquets in Cachar.

(480) *PALÆORNIS SCHISTICEPS*.—The Slaty-headed Paroquet.

Hume, No. 150.

The least often met with of all, and keeping, generally speaking, much to the higher parts.

The Laisung Valley, often mentioned before in these papers, is a very favourite resort of these birds.

(481) *PALÆORNIS FASCIATA*.—The Red-breasted Paroquet.

Hume, No. 152.

Nearly as common as *P. (cyanocephalus) rosa*.

This bird is a very early breeder, often laying in the last few days of January and sometimes even in the end of December.

On the 12th of March I had a shot at a flight of these birds as they flew over my head across a road, and, of the five birds which dropped, four proved to be birds of the season, still, of course, in their first plumage and with their tails short, but birds strong on the wing and which had left the nest for some days.

I know no other Indian Paroquet with such a deep, hoarse, trumpet-like screech as this species has, and its call can be recognized from a long way off.

(482) *LORICULUS VERNALIS*.—The Indian Lory.

Hume, No. 153.

A very common bird at all heights up to 4,000 feet, but principally below 3,000 feet.

They breed in February and March.

THE BUTTERFLIES OF THE NORTH CANARA DISTRICT
OF THE BOMBAY PRESIDENCY.

By J. DAVIDSON, T. R. BELL, AND E. H. AITKEN.

PART III.

(With Plate VI.)

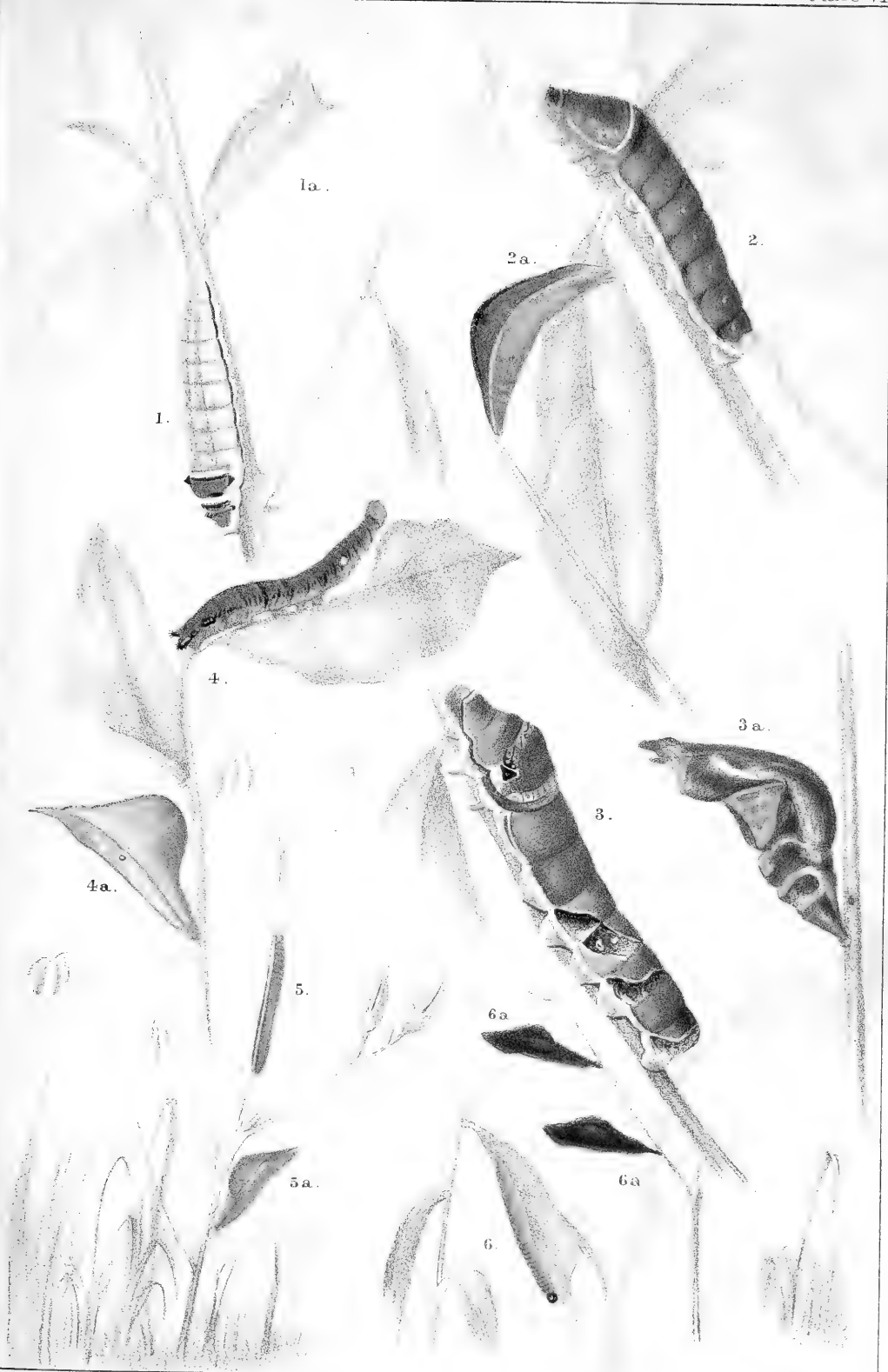
(Continued from page 393.)

Family PAPILIONIDÆ.

Sub-Family PIERINÆ.

The "Whites" are fond of open country, and the sub-family, as might be anticipated, is not very well represented in our district. Several species which are among the commonest butterflies in other parts of the Presidency are wanting or rare here. On the other hand, we have one or two peculiarly forest forms.

A word of explanation or apology is necessary about the specific names which we have adopted. No group of butterflies has received less mercy from the species-makers than this, and it would not be difficult to double the length of our list out of the material in our collections; our aim has not been to publish a long drawn-out list, but to give such real information as we can about those kinds of butterflies which, after six years of collecting and breeding, we believe to inhabit the district. Now a difficulty arises. Given a very variable butterfly, the seasonal and casual varieties of which appear to us to have been described under a dozen different names, how shall we indicate it? One way would be to head the description with a list of the names which have been given to it and let each reader take his choice. Another way is to select the name that seems to have priority. But we have neither the ability nor the inclination for the kind of research that is necessary to carry out either of these methods, and, besides this, we have not access to the necessary books and collections. To attempt it with the resources which are at our disposal would only add to the existing confusion. We have decided, therefore, to disclaim all pretence that our name in any case is the name under which the species ought finally to stand, and to be satisfied if we can indicate clearly in each case the butterfly that we mean. If anybody believes that we are indicating not one but several totally distinct species, no harm is done; he will find our account of the habits and metamorphoses equally applicable to them all!





All the larvæ of this sub-family lie, when full-grown, on the upper-side of the leaf and, when solitary (some of them are gregarious) along the mid-rib, coating the leaf where they lie with a bed of silk. The eggs are generally laid singly on the upper surface of the leaf or on young shoots; exceptions to this are *Teracolus amatus*, Fabricius; *Appias hippoides*, Moore; and *Delias eucharis*, Drury (this last is aberrant also in that the eggs are laid on the underside of the leaf where the larvæ herd together); *Belenois mesentina*, Cramer; *Terias silhetana*, Wallace; which lay their eggs in clusters; the larvæ of these, when young, are gregarious, but generally, when full-grown, separate where the food is plentiful. The egg of the sub-family is spindle-shaped, standing on one end, and is always more or less strongly ridged longitudinally and striated finely transversely; in colour it is generally pure white, turning to yellow or orange; that of *Nychitona xiphia*, Fabricius, is blue, and that of *Huphina* blotched with red.

With few exceptions, the *Pierinæ* are very much alike in the larva state, more alike than the different species of one genus often are among the *Nymphalidæ*. The head is large, the body long and somewhat depressed, without excrescences, but rough owing to the presence of minute tubercles discernible generally only with the aid of a lens. The colour is green, with usually a lateral stripe. The genera *Catopsilia* and *Terias* feed on leguminous plants, and all the rest, but two or three, on capers.

139. *Nychitona xiphia*, Fabricius.

This is met with in all parts of the district, flitting about among underwood in shady places. Like many of the *Pierinæ* it is absent, or almost so, from June to September. We have bred it on capers. (*C. heyneana*, Watt. Cat.; *C. religiosa*, Forst.) Both the larva and pupa are very like those of *Terias hecabe*, Linnæus, but more delicately formed. The larva is green, with a pale glaucous tinge about the bases of the legs, and slightly hairy. The pupa is sometimes green, but oftener of a delicate pink shade. Perhaps in a natural arrangement this species ought to stand next to *Terias*, but the imago seems very different, and the resemblance in the larva and pupa states may be superficial.

140. *Delias eucharis*, Drury.

This is very common everywhere and at all seasons, except during the two or three months when the rainfall is heaviest. The larva and

pupa have been described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 358, No. 56, 1890). This is one of the exceptions mentioned above. The larva is quite unlike those of the sub-family generally, and does not feed on either a leguminous plant or a caper, but on the "mistletoe" (*Loranthus*).

141. *Prioneris sita*, Felder.

This is certainly one of our most valuable butterflies. It cannot be distinguished from *Delias eucharis*, Drury, on the wing unless a very close and clear view is obtained; so doubtless we have seen more than we know, but we have only caught seven specimens in all. Of these, two were caught at the Gairsoppa Falls, or on the way to them, but we know that it occurs as far north as Karwar.

142. *Catopsilia pyranthe*, Linnæus.

This is common everywhere and all the year round. Unlike the next species, it varies little; occasionally a specimen is obtained in which the underside is more yellow than green, and the ferruginous markings are unusually large and distinct. We have described the larva and pupa in our former paper (Journal Bombay Natural History Society, Vol. V, p. 360, No. 61, 1895). The only food-plant, as far as our present knowledge goes, is *Cassia occidentalis*.

143. *C. crocale*, Cramer.

If *C. catilla*, Cramer, is really a distinct species from this, we confess that we do not know the difference between them. All the *Catopsilias* we have seen which are not *C. pyranthe*, Linnæus, appear to us to differ from each other and merge into each other in a way which makes it impossible to divide them into groups and say this is distinct from that. They refuse *Cassia occidentalis*, the food of *C. pyranthe*, but feed on almost any arboreal *Cassia*. Larvæ are most plentiful in April, June, and September, but the butterfly may be seen any month in the year. The transformations are described in our former paper (Journal Bombay Natural History Society, Vol. V, pp. 360-361, Nos. 62-63, 1890).

144. *Terias hecabe*, Linnæus.

It is not necessary to waste space on this butterfly, which is as common in Canara as elsewhere. The transformations are described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 359, No. 60, 1890) and are figured here, Plate VI, figs. 5, larva; 5a, pupa.

145. *T. silhetana*, Wallace.

In describing the larva of *T. hecabe*, Linnæus, in our former paper, we said that we had once got fourteen black pupæ all on one dry twig and so close to each other that they almost touched. We did not distinguish the butterflies which emerged from *T. hecabe*; indeed, until the publication of Captain E. Y. Watson's very valuable paper on the synonymy of some species of Indian *Pierinæ* in Vol. VIII of this Journal, p. 489 (1894), we made no attempt to sort our specimens under the multitude of names with which Messrs. Butler, Moore, and Swinhole have enriched the genus. We have since discovered, however, that these black pupæ are not to be found on the ordinary food-plants of *T. hecabe*, but on *Wagatea spicata*, and that they result from a gregarious larva with a black head. This leaves no doubt that they belong to a distinct species, and, having compared the butterflies which emerged from a large number of both kinds, we find that those produced from the black-headed larva and black pupa bear the three dark streaks or spots in the cell in addition to the reniform spot on the disco-cellular nervules on the underside of the forewing, by which Captain Watson separates *T. silhetana* from *T. hecabe*. We have figured the larva and pupa on Plate VI, figs. 6, larva; 6a, pupa. The two species appear to be almost equally common in the district. It is perhaps worth mentioning that we have a specimen of *T. silhetana* caught in October, in which the ground-colour is pure white instead of yellow. The markings are normal.

146. *T. libythea*, Fabricius.

In the name we have given to this we follow Captain Watson's paper above mentioned. The butterfly is fairly common in many parts of the district, but does not seem to appear till the monsoon is over. The larva is not distinguishable to our eyes from that of *T. hecabe*, Linnæus; the pupa is shorter and has the snout slightly upturned. It feeds on a leguminous plant. The dry-season form is probably *T. senna*, Felder, into which it gradually grades.

147. *T. læta*, Boisduval.

This species is not nearly so common in Canara as in other parts of the Presidency, but occurs at the Northern end of the district. We have not bred it.

148. *Teracolus amatus*, Fabricius.

We have described the larva and pupa of this in our former paper under the name of *T. cypræa*, Fabricius, which latter Captain Watson has shown in his paper quoted above to be a synonym of *T. amatus* (Journal Bombay Natural History Society, Vol. V, p. 359, n. 59, 1890). In all respects it seems to us to stand very near to *Terias*. In its food it is eccentric, choosing a curious tree which we believe almost forms a natural order of its own—*Salvadora persica*. The tree is found in certain spots, often on the sea-shore, but sometimes far inland where there chances to be salt in the soil. The butterfly is found near the tree and nowhere else. We have found larvæ in May and November. The females are sometimes white instead of the usual salmon-colour.

149. *T. etrida*, Boisduval.

This can scarcely be called a Canara butterfly, though we have seen one specimen in the district. We described its transformation in our former paper (Journal Bombay Natural History Society, Vol. V., p. 359, n. 58, 1890). The larva and pupa of the nearly-allied *T. eucharis*, Fabricius, are of the *Nepheronia* type.

150. *Ixias pyrene*, Linnæus.

We have met with this at a place half-way up the ghât on the road to the Gairsoppa Falls, and doubtless it may be found on the skirts of the district elsewhere, but one of the first things that strike a collector in the Canara forests is the absence of this and its sister *I. marianne*, Cramer, both so common in other parts of the Presidency. All the specimens we have seen from this district belong to the form *I. singalensis*, Moore.

We have bred *I. marianne* elsewhere, but not *I. pyrene*; the larva and pupa of the former and therefore doubtless of this are of the *Nepheronia* type.

151. *Hebomoia glaucippe*, Linnæus.

This grand butterfly occurs in most parts of the district from September or October till May. It is rare on the coast, but common on rocky islands not far from the shore, in which a prominent feature of the vegetation is a climbing caper (*Capparis Moonii*, Wight) with large, showy flowers, on which it lays its eggs. It is also fond of a tree belonging to the same order which grows in the beds of mountain

streams (*Crataeva religiosa*, Forst). Horsfield's figure of the larva and pupa have been copied into many books and are well known.

152. *Nepheronia pingasa*, Moore.

This is very common all through the monsoon, but disappears in October, and its place is taken till the following May by the next two species. We have almost come to the conclusion that they are all one species. If this is the case, it is curious that the *N. pingasa* form is unknown further north. It must be a special monsoon form, developed by the heavy rainfall, or the abundant vegetation, of this district. *Danaüs limniace*, Cramer (on which see our remarks *ante*, p. 240, n. 3), appears to furnish a similar example. We have described the larva and pupa of this species in our former paper (Journal Bombay Natural History Society, Vol. V, p. 357, n. 55, 1890), but figure them now (Plate VI, figs. 4, *larva* ; 4a, *pupa*).

The pupa of this together with those of *Teracolus etrida*, Fabricius, and *Ixias* are exaggerated examples of the form found in *Teracolus amatus*, Fabricius, and the preceding four genera, in which the thorax is compressed and the wing-cases produced into a keel. *Capparis heyneana* is the usual food-plant.

153. *N. hippia*, Fabricius ; *N. fraterna*, Moore.

Both these are plentiful during the dry-season, the former being commoner in the south. We are much inclined to believe they are only varieties of one species. The spots in the dark border of the forewing, by which the former is distinguished, vary so much in size in different specimens that it is difficult to attach much importance to their absence. We have found larvæ of one or other on the same plant as those of *N. pingasa*, Moore, and have been able to distinguish them ; the tail-points of the larva of this are much more widely and squarely separated than in that of *N. pingasa*. Females are occasionally caught with a dash of yellow on the inner margin of the hindwing.

154. *Appias libythea*, Fabricius.

This is a very common butterfly in the forests on the slope and crest of the ghâts throughout the dry-season. Wherever a patch of moist sand presents itself in the bed of a mountain stream, they form a quivering white cloud, tinged with yellow by the next species and speckled with green by *Papilio sarpedon*, Linnæus. We have not seen the butterfly much about Karwar and conclude that it is little on the

wing during the rainy season. The larva and pupa were described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 358, n. 57, 1890). The larva is of the form which we have mentioned as characterising nearly the whole of the sub-family, but with this species we enter on quite a new type of pupa. The band is short, so that the ventral side is applied close to the surface to which the pupa is attached; the thorax is stout and not compressed or keeled; segment No. 7 bears on the back a sharp transverse ridge ending in pointed lateral processes. *Capparis horrida* seems to be the favorite food of this species; also commonly found on *Crataeva religiosa*, Forst. Eggs laid singly.

155. *A. (Catophaga) hippoides*, Moore.

Our yellow *Appias*, which we have put under this name with some misgiving, is found in the same situations as the last, and is almost as common, but seems to come out more during the rainy season. It has in fact a distinct rainy-season form, which, we understand, should be known as *C. taprobana*, Moore. We have bred it from December to May on capers. The eggs are laid in clusters. The larva and pupa are not very different from those of the last species; the pupa may be distinguished from the last by the second segment being produced laterally into a tongue-like process which embraces the shoulder.

156. *A. (Catophaga) neombo*, Boisduval.

This species is found in the forests on the slope of the ghâts during the dry season, but is not by any means so numerous as the last two. The sexes vary surprisingly in size, so much so that we were tempted to think there was more than one species, but we have since ascertained that the small specimens are invariably females and the large ones males. We have not bred this, but saw one laying her eggs on a climbing caper.

157. *A. (Catophaga) wardii*, Moore.

We have caught a few specimens of this in the district chiefly in the southern parts. We have not bred it.

158. *Huphina phryne*, Fabricius.

This is very common everywhere, but much less so in the monsoon than in the dry-season. The larva and pupa are of the same type as those of *Appias*, but stouter. The larva is green, and the pupa green with brown and white edgings. Food-plant, capers as usual,

159. *H. remba*, Moore.

Captain E. Y. Watson considers this to be a local race of *H. nadina*, Lucas = *H. nama*, Moore ; but it is such a very well-marked form that it deserves a distinct name. In its rainy-season dress it is a very richly-coloured butterfly, the female being more black than white on the upperside, and on the underside rich greenish-yellow mingled with smoky-brown. It is a forest butterfly and is found wherever there is heavy forest at all seasons. The larva and pupa are scarcely distinguishable from those of the last species and feed on the same plants.

160. *Belenois mesentina*, Cramer.

With this species we have completed the circle and got near to *Delias eucharis*, Drury, again. It feeds on capers, but in the form of the larva and pupa shows a decided approximation to those of *D. eucharis*. The larva is cylindrical and sparingly clothed with long white hairs springing from small tubercles. It is rather a handsome creature, coloured yellow-ochre and purplish-brown. The pupa, which is green and yellow, is more like that of *D. eucharis* than the preceding species. The butterfly is not common in Canara generally, but we have met with it at the northern end of the coast, on the borders of the Portuguese territory (in which it is plentiful), and also, curiously enough, on one of those rocky islands which we have mentioned as being much affected by *H. glaucippe*, Linnæus. The larvæ are gregarious throughout their existence, the eggs being laid in batches of from ten to forty.

Sub-family PAPILIONINÆ.

In our former paper we arranged the butterflies of this sub-family in four groups according to the form and food of the larva, and we will adhere to the same plan here.

The eggs of this sub-family are spherical, smooth, red or green in colour, often blotched with yellow or red respectively, this blotchiness being due to a waxy accretion ; the green eggs soon become yellow ; the red eggs, which are orange when first laid, only occur in the *Ornithoptera* group, and characterise it. The egg is generally laid on the young shoots, which the larva, emerging, eats ; in the case of *P. abrisa*, Kirby, however, the egg is laid low down on the tree

on the old leaves which the larva eats and prefers. Only in one case are the eggs laid any way but singly, namely, in the case of *P. demolition*, Cramer, mentioned in our former paper (Journal Bombay Natural History Society, Vol. V, p. 367, n. 75, 1890). The larva when full-grown lies in the centre of the top of the leaf along the mid-rib.

THE ORNITHOPTERA GROUP.

The larvæ of the three species in this group are so much alike that it requires some care to distinguish them from each other. We have described them all in our former paper (Journal Bombay Natural History Society, Vol. V, p. 361, 1890). They are soft, fat, blackish caterpillars, with six longitudinal rows of fleshy processes more or less tipped with red or pink. That of *O. minos*, Cramer, is of course much larger than the others when full grown, but the only prominent distinguishing mark at an earlier stage is a diagonal band of pinkish-white on each side, crossing the 7th and 8th segments. *P. hector*, Linnaeus, wants this entirely (except that occasionally there are some pink spots), while *P. aristolochiæ*, Fabricius, has a belt of white encircling the body at the 7th segment. In Canara they all feed on *Aristolochia indica*, a creeper with bitter leaves, supposed to cure snake-bite. It generally withers up entirely in the cold season, but the root remains, and the butterflies seem to lay their eggs on the dry twigs to await the arrival of fresh leaves in June. In the Deccan *A. bracteata* serves as a good substitute for *A. indica*, and we have found larvæ on an allied plant in a garden. The pupæ of the three butterflies are alike in their general form,—stout, somewhat flattened, and dilated in the middle, with the thorax and head thrown back; but *P. hector* and *P. aristolochiæ* are more angular than *O. minos*, and have pairs of flattened tubercles, or follicles, on the abdominal segments. The colour is usually light brown, but *O. minos* has always a conspicuous yellow saddle-mark on the back. These three species are protected by an offensive smell, and doubtless taste similarly also (we have not tasted them) both in the larval and perfect states. Accordingly they seek no concealment. The larvæ are always conspicuous by their colour, resting on the stems and under the leaves of the plant, and the butterflies rest with their wings expanded. Hundreds are destroyed, however, by a small ichneumon, which seems to have no objection to the taste.

161. *Ornithoptera minos*, Cramer.

This butterfly is very common during the latter half of the monsoon. By the end of the year it has become scarce (at least on the coast), and many are not seen after that until the beginning of June, when the first rain brings them out in some numbers. In its habits it is very like the next two species, flying slowly, but often at a good height, and hovering much over flowers. There is perhaps no other living creature in the district which so stirs the spirit of a naturalist when he first sees it, and the effect takes long to wear off; common as the butterfly is. The transformations are described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 361, n. 64, 1890).

162. *Papilio hector*, Linnæus.

This richly beautiful, but vulgarly common, butterfly appears at the same time as the last, as might be expected, since it feeds on the same plant, but it is of course more plentiful at all seasons. The transformations are described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 362, n. 65, 1890).

163. *P. aristolochiæ*, Fabricius.

This is even commoner than the last. As late as January we have seen a mango tree in bloom literally alive with them at an early hour in the morning. Both this and the last travel much, and in that they differ from the butterflies of the next two groups which have usually a limited beat. The transformations are described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 362, n. 66, 1890).

THE AGAMEMNON GROUP.

These feed exclusively, or almost exclusively, on the *Anonaceæ* and *Lauraceæ*, and there is a strong family likeness in the larvæ and pupæ. They are not "protected," and accordingly are very different in their habits from those of the last group. In the perfect state they are swift and restless and, when they settle at all, close their wings behind their backs. In the larva state they are wary, resting motionless on the upperside of a leaf, from which they wander to feed at long intervals. We have described the larvæ and pupæ of all the species in the group, except one, in our former paper, and need not do it again here. Those of *P. agamemnon*, Linnæus, which may be found on the custard-apple tree in any garden, are a type of them all.

164. *P. agamemnon*, Linnæus.

This is pretty common everywhere, frequenting gardens and forests. In the former it feeds chiefly on the custard-apple, and in the latter on several trees of the same order. Larvæ appear in June, and again more abundantly three months later, at which time the butterfly is most common, but it may be met with every month in the year. The transformations will be found described in Journal Bombay Natural History Society, Vol. V, p. 363, n. 67, 1890.

165. *P. teredon*, Felder.

In the Canara District this species, which is a local race of *P. sarpedon*, Linnæus, is commoner than the last, and may be seen all through the dry-season as well as in the rains, but rarely in gardens. Nothing suits it better than a clearing in heavy forest, with a stream of water to keep the ground cool and moist, for it is a thirsty creature. As an example of the capricious tastes of nearly allied butterflies, we may mention that we have never found a single larva of this species on "Wom" (*Saccopetalum tomentosum*), which is the only food, as far as we know, of *P. nomius*, Esper, and a favourite with both *P. agamemnon* and *P. doson*, while we have reared many on *Alseodaphne semicarpifolia*, which none of those three eat. The transformations are described in our former paper under the name of *P. sarpedon*, Linnæus (Journal Bombay Natural History Society, Vol. V, p. 364, n. 68, 1890).

166. *P. telephus*, Felder.

This species, which is a local race of *P. eurypylus*, Linnæus, may be found wherever the last is found in this district, though it does not occur further north. It is quite as thirsty a creature, and usually contributes to the crowd that collect about moist ground in open places in the forest, but it is scarcely so numerous as the last. The larva and pupa are described and figured in our former paper under the name of *P. doson*, Felder (Journal Bombay Natural History Society, Vol. V, p. 364, n. 69, 1890).

We have met with three specimens of this butterfly in which the green of the upperside was replaced by a pale straw-yellow. They were larger than average specimens. This may be an accidental "sport," or a variety produced by difference of food. It is well known that the colour of certain European butterflies and moths is

affected when they are reared on a different leaf from that which is their ordinary food.

167. *P. nomius*, Esper.

This is plentiful enough where it occurs (much more so, however, in some years than others), but is very local, and its appearance is limited to the hot season and the first two months of the rains. More than half the year, from the end of July till at least March, or oftener May, is passed in the pupa state under stones and roots. We have given a full description and figure of the transformations in our former paper (Journal Bombay Natural History Society, Vol. V, p. 364, n. 70, 1890).

168. *P. antiphates*, Cramer.

Our acquaintance with this species is limited. We first met with it at Gairsoppa in the south of the district, but have since found it at one or two places further north. It begins to appear in March, and there can be little doubt that it is on the wing for a few months only, like *P. nomius*, Esper, which it resembles in many respects. On the 26th of April, 1893, a female was kind enough to lay a single egg in the presence of a member of our firm, and though the little caterpillar which emerged perished by starvation, the plant (*Unona lawii*) not being obtainable at his next camp, we succeeded in getting a few more next year and are able to present our readers with an amateur figure, Plate VI, figs. 1, larva; 1a, pupa. The most unusual feature of the larva is that in its early stages it is pure white, marked only with thin transverse lines of black or dark green. At the last moult but one it becomes yellow, with thicker lines, and after the last moult attains the colour shown in the figure, showing a distinct resemblance to the larva of *P. nomius*. The pupa is supported by an uncommonly long band, and from its green colour would seem to be normally formed on the plant and not under stones.

THE ERITHONIUS GROUP.

These are distinctly separable by the form of the larva and pupa from the last group, though much nearer to it in these respects and also in habits than to the "protected" *Ornithoptera* group. They all feed on plants of the orange order (formerly *Aurantiaceae*, now *Rutaceae*, including the Rue, which the butterflies included from the beginning), but each species affects certain plants and refuses others which are eaten by other members of the same group.

169. *P. erithonius*, Cramer.

The Hon. Walter Rothschild in "Novitates Zoologicae," Vol. II, p. 279, n. 67 (1895), has recently shown that this species should be known by the older name, *P. demoleus*, Linnæus; but we have allowed the better known name to stand here. The larva and pupa of this, which may be found on almost any kind of Orange or Lime, or on the common, evil-smelling garden Rue, which no other member of the group will eat, may serve as a type of the whole group. The butterfly is very common, frequenting gardens more than forest, and appearing from October till at least January, and in less numbers after that till June. The larva and pupa are described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 366, n. 71, 1890).

170. *P. polytes*, Linnæus.

This also is very common and very destructive to orange and lime trees in gardens. In the forest we have found it most commonly on *Glycosmis pentaphylla*, Correa, and *Zanthoxylum Rhetsa*, D. C. Prod. It is on the wing at all seasons, but most numerous about September and October. Females of the same colour as the male (the *pammon* form) are scarce in this district, but we have one or two specimens. The larva and pupa are very like those of the last species, indeed the larva is sometimes difficult to distinguish. They are described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 366, n. 72, 1890).

171. *P. polymnestor*, Cramer.

Common wherever the country is sufficiently wooded, most so about September and October. Its favourite food is a wild lime which occurs in all the forests. The larva and pupa are just like those of the last on a larger and coarser scale. We described them in our former paper (Journal Bombay Natural History Society, Vol. V, p. 366, n. 73, 1890).

172. *P. daksha*, Moore.

This may be met with in the same situations as the last and at any time of the year, but is not nearly so numerous. We described the larva and pupa in our former paper under the name of *P. helenus*, Linnæus (Journal Bombay Natural History Society, Vol. V, p. 367, n. 74, 1890), but figure them now—(Plate VI, figs. 3, larva; 3 a,

pupa). They are not very easy to distinguish with certainty from those of the last. The usual food is *Zanthoxylum Rhetsa*, D. C. Prod.

173. *P. demolition*, Cramer.

We may discard the *alias*, *P. liomedon*, Moore, under which we described and figured the transformations of this species in our former paper (Journal Bombay Natural History Society, Vol. V, p. 367, n. 75, 1890). It is not a rare butterfly in Canara, but more local than most, owing perhaps to its feeding exclusively (so far as we know) on *Acronychia laurifolia*, Bl. Bijl., a tree which is almost confined to the tops of wooded hills. We have met with the butterfly chiefly from August to October.

174. *P. tamilana*, Moore.

This magnificent butterfly is one of the two species of *Papilio* which have as yet successfully defied us to find their larvæ, but we have no hesitation in putting it into this group. It can scarcely belong to any other. It is found in many parts of the district as far north as Castle Rock during the rains and also in March and April, but it is very local. Like most of the group it has a regular beat, round and round which it goes during the hottest hours of the day, with little change; so that, by taking your stand where one has passed, you may make pretty sure of meeting it again every half hour or so, that is, if you go on missing it. If you catch it that ends the fun. Of course you get only males in that way. We do not know how females are to be got. Two specimens have fallen into our hands by accident.

175. *P. buddha*, Westwood.

This species, which is even more splendid than the last, appears to be spread over the whole district, affecting cultivated tracts as well as forest, and is by no means rare in some parts; but it is one of the most difficult of all butterflies to come by. It usually flies very high and fast, and seldom alights or hovers over flowers. When caught, if not already broken, it often contrives to break off a goodly bit of one wing in the net. We had long been sure that it laid its eggs on *Zanthoxylum rhetsa*, D. C. Prod., already mentioned as the favourite food of *P. daksha*, Moore, and at last, on 24th September, 1892, we got one larva. This died two days after of mere "cussedness," but we had got on the scent now, and hunted every accessible leaf of every known tree within some miles of Karwar. To realise the difficulties

of the search, it must be remembered that the "Tirphal" tree is studded with thorns on every branch and twig and all down the stem to the roots, while the wood is so brittle that even the principal boughs will scarcely bear the weight of a man. Add that the caterpillar rests motionless on the upperside of a leaf, which is of exactly the same shade of green as itself, and that it is slightly speckled with a paler shade in imitation of the effect produced on the leaf by minute insects eating away the soft tissue. However, with the aid of ladders, we got four larvæ, of which we succeeded in rearing three. Next year we did not find any, but in 1894 the butterfly was unusually common, and we got several. The larva, though somewhat aberrant, clearly locates the butterfly in this group. When young it is spiny, as they all are, but when full-grown only two pairs of minute sharp processes remain on the second and last segments. A thin, but well-defined, yellow ridge, commencing at each side of the second segment, encircles the fifth segment, enclosing an oval space as seen from above. The colour is green, faintly freckled as mentioned above. When at rest the larva often holds the head and forepart raised after the manner of a *Sphinx* moth. The pupa is in outline a little like the others of the group, but it is straighter, less angular, and entirely wants the dorsal process on the thorax. The head processes are long and up-turned. The back is keeled, and the sides also in a less degree. The colour is a wonderful example of "protective resemblance." It consists of two shades of green, sharply separated by the lateral keel. The ventral half, which is of course uppermost, has the dark green tint of the upperside of the leaf of *Z. rhetsa*; while the dorsal half, like the underside of the same leaf, is of a pale and dull shade. We do not understand the seasons of the butterfly's appearance. It is not seen in June or July, but begins to appear in August, is common by October, and may be met with till the end of the year. Now the "Tirphal" tree looses every leaf soon after the close of the monsoon, and remains bare until the following April at least, more often till June. We are almost forced to conclude that the butterflies which we see from October onwards lay their eggs on the dry trees, and that these, hatching in the following June, produce the first butterflies seen in August. There may then be one or even two larger broods before the trees become unfit for food. (Plate VI, figs. 2, larva; 2 a, pupa).

176. *P. abrisa*, Kirby.

This butterfly easily passes for *P. panope*, Linnæus, on a careless view, and even for *Euplœa core*, Cramer, so that it may well be less rare than might be supposed from the number of specimens caught or noticed. At Karwar, however, it is certainly not common. Most of our specimens have been caught on the ascent of the ghâts, or at the top. A larva, found feeding on *Glycosmis pentaphylla*, Correa, was taken for a dull specimen of *P. polytes*, Linnæus, and only when it became a chrysalis did we note that it was different. The chrysalis differs from that of *P. erithonius*, Cramer, chiefly in that it is more bent back in the thorax, and in that the apex of the thorax is produced into a short, blunt, parallel apipedal process; it is coloured like that of *P. polytes*, Linnæus.

THE DISSIMILIS GROUP.

177. *P. dissimilis*, Linnæus, or *P. panope*, Linnæus.

The Hon. Walter Rothschild in "Novitates Zoologicae," Vol. II, p. 364, n. 136 (1895), has recently shown that the dark form of this species usually known as *P. panope* should be known as *P. clytia*, Linnæus, which name stands for the species; and that *P. dissimilis* is the form with striate black and white wings. We have, however, allowed the latter name to stand here, as it is better known in India than *P. clytia*.

This species constitutes our fourth group, for it cannot be classed with any of the others. The larva, which is evidently "protected," is handsomely and strikingly coloured. In form it most resembles the larvæ of the *Ornithoptera* group, but it feeds on *Laurinæ*, most commonly on *Alseodaphne semicarpifolia*, Nees. The pupa resembles nothing so much as a dry twig. This is protective "mimicry," showing that the offensive qualities of the larva are cast off with its skin. The butterfly carries on the same deception, passing itself off for *Danaïdæ*, Cramer, and *Euplœa core*, Cramer.

The two forms are about equally common, and both may be reared from any batch of larvæ. There have been opposite statements about the flight of this butterfly. The fact is that it *can* fly exceedingly fast, but usually imitates the lazy manner of the two butterflies which it impersonates. The transformations have been described in our former paper (Journal Bombay Natural History Society, Vol. V, p. 368, n. 76, 1890).

178. *P. pandiana*, Moore.

This is the other of the two *Papilios* of which the larvæ remain undiscovered, and for the present it must stand outside our groups, for we do not know where to place it. It closely resembles *T. aristolochiæ*, Fabricius, in colour and form, but according to the "mimicry" theory this is an argument against there being any affinity between them, for if it also were inedible, there would be no purpose in the imitation. It is a South India species, and perhaps little more than a straggler with us, but there are one or two places on the ascent of the ghâts where it is not uncommon.

The larva probably feeds on *Rutacæ*, as we once saw a female fluttering about in the underwood among plants of this order. It has the flight of *P. aristolochiæ*, Fabricius, and has the same habit of hovering about flowers in the early mornings. The imago is never found far from evergreen jungle.

EXPLANATION OF PLATE VI.

Figs. 1,	1a...	Larva and pupa of <i>Papilio antiphates</i> , Cramer, p. 579.			
„ 2,	2a...	„	„	„	<i>buddha</i> , Westwood, p. 581.
„ 3,	3a...	„	„	„	<i>daksha</i> , Moore, p. 580.
„ 4,	4a...	„	„	„	<i>Nepheronia pingasa</i> , Moore, p. 573.
„ 5,	5a...	„	„	„	<i>Terias hecabe</i> , Linnæus, p. 570.
„ 6,	6a...	„	„	„	<i>silhetana</i> , Wallace, p. 571.

(To be continued.)

A ROUGH KEY TO THE IDENTIFICATION OF INDIAN OPHIDIA.

BY A. G. CARDEW, I. C. S.

(Read before the Bombay Natural History Society on
September 22, 1896.)

A word of apology is necessary in laying before the readers of this Journal the rough key to the identification of Indian snakes which is printed below. It will be obvious to everyone that the key is purely artificial, and brings into juxtaposition snakes belonging to widely separate families. The key, it will be seen, does not pretend to be scientific, but is merely an attempt at such an arrangement as may enable unskilled observers to identify specimens of Ophidia by *external characters*. If reference is made to the synopsis of families which is given by Mr. Boulenger on page 234 of his work on "Reptilia and Batrachia" in the India Office series of manuals on the Fauna of British India, it will be observed that the families are there distinguished by criteria drawn mainly from the bony structure of the head. In order to apply this synopsis to the identification of snakes, it is necessary to acquire a larger knowledge of the skeleton of a snake than is common, and it therefore seems possible that an artificial key, based on characters which any one can see and understand, may sometimes be useful.

The first principle of division which has been adopted in arranging the snakes for the purposes of the key is the number of scales round the body. On page 281 of Mr. Boulenger's work will be found a diagram showing the scaling on *Dendrophis pictus*, and from this will be apparent the manner in which the scales should be counted. The first step in applying the key to the identification of an unknown snake would, therefore, be to count the number of scales round the body. As soon as this has been ascertained, it will be found that, whereas before there were some 260 species to anyone of which the snake might belong, the range of search has now been narrowed to 30 or 40 species. The next step is to count the number of subcaudals and ventrals. This is easily done, and with the aid of these two characters combined, the area within which the snake must occur is usually made much smaller. If the snake were *Dendrophis pictus*, for example, it would be at once apparent that the snake must be looked for in one of the genera *Dryophis*, *Dendrophis* or *Zamenis*. The third test to be applied is the

shape of the pupil of the eye. This is of less service than the preceding criteria, but it at once excludes the genus *Dryophis* from consideration in the examination of the snake assumed. The fourth character adopted is the number and arrangement of upper labial shields, the positions of which are shown in the diagram on page 278 of Mr. Boulenger's work. We have already arrived at the conclusion that the snake we are examining must either be *Zamenis korros* or a *Dendrophis*. The number of upper labials in *Z. korros* being 8, and that in *Dendrophis pictus* being 9, the area of search would now be narrowed down to the genus *Dendrophis*, and as Mr. Boulenger gives easily applied keys based on external characters for the ascertainment of all species within the genera, the specific identity of the snake can, with the aid of his book, be now ascertained with certainty.

The rough key here printed does not, therefore, pretend in many cases to do more than direct the observer to the correct genus. It will often indicate the species, but in large genera, such as *Silybura*, *Simotes*, *Tropidonotus*, etc., it would have taken up too much space to give criteria sufficient for the identification of each species, and it would also have been waste of time to do so, as they are easily available in Mr. Boulenger's book, which everyone attempting to use this key should possess. The chief drawback which seems likely to attend the use of the key is the variation which undoubtedly occurs in some of the characters adopted as criteria. The number of upper labial plates, of ventrals, and subcaudals is liable to vary from that adopted in the key, and to this extent identification may be made more difficult. But it is hoped that this source of error will not be sufficiently important to deprive the key of all utility.

It should be added that where the number of scales round the middle of the body varies from the number of scales round the neck, the former has been adopted. The last two snakes in the key, the Cobra and the Hamadryad, did not lend themselves to the arrangement adopted, and being well known, have been placed by themselves at the end. In the *Typhlopidae* the scales can hardly be said to be in so many "rows"; but the same phrase has been retained throughout for convenience. In many of the marine snakes the number of ventrals and subcaudals could not be given, but little difficulty is likely to arise over the identification of this class of snake. In conclusion, it should be once more stated that the imperfections of the key are fully recognized and that it is only presented as a possible assistance to those whose study of snakes is in an elementary stage.

A ROUGH KEY TO THE IDENTIFICATION OF INDIAN OPHIDIA.

	No. of Sub-caudals.	No. of Ventrals.	Shape of Pupil of Eye.	No. of Upper Labials.	Other Criteria.
A.—SNAKES HAVING 13 ROWS OF SCALES ROUND THE BODY.					
<i>Calamaria pavimentata</i> ...	13—27	140—182	Round	... 4, 2nd and 3rd entering eye.	...
" <i>catenata</i> ...	41	187	Do.	... 5, " "	...
<i>Xylophis perroteti</i> ...	17—38	130—147	Do.	... 5, 3rd and 4th " "	...
<i>Rhythin reticulata</i> ...	19—29	127—150	Vertically subelliptic	... 5, " "	...
<i>Simotes plumiceps</i> ...	27	132	Round	... 5, " "	...
<i>Trachisium fuscum</i> ...	33—42	130—162	Vertically subelliptic	... 5, 3rd entering eye.	...
" <i>guentheri</i> ...	33—38	132—145	Do.	... 5, " "	...
" <i>tenuiceps</i> ...	34—39	134—138	Do.	... 5, " "	...
<i>Adenophis intestinalis</i> ...	15—28	223—273	Round	... 5, " "	...
<i>Callophis maculiceps</i> ...	21—32	205—247	Do.	... 7, " "	...
" <i>trimaculatus</i> ...	24—35	28—274	Do.	... 5, " "	...
" <i>macellandii</i> ...	25—34	182—224	Do.	... 5, " "	...
" <i>bibronii</i> ...	27—34	222—226	Do.	... 7, " "	...
" <i>nigrescens</i> ...	33—44	232—251	Do.	... 7, " "	...
<i>Trimeresurus macrolepis</i> ...	48—56	134—140	Vertical	... 7 or 8 ... ..	...
<i>Ablaes scriptus</i> ...	64—76	130—154	Round	... 3, 3rd, 4th and 5th entering eye.	...
<i>Hydrophobus nympha</i> ...	71—88	200—243	Vertically elliptic	... 7 (exceptionally 8 or 6), 3rd and 4th entering eye.	...
" <i>davisonii</i> ...	91—108	235—265	Do.	... 7, 3rd and 4th entering eye.	...
<i>Dendrelaphis caudolineatus</i> ...	100—112	176—188	Round	... 5, 5th and 6th " "	...
<i>Dendrophis caudolineatus</i> ...	124—128	149—161	Do.	... 8 or 9, 4th and 5th, or 5th and 6th entering eye.	...
B.—14 ROWS OF SCALES ROUND THE BODY.					
<i>Glanconia blanfordii</i> ...	...	Covered with uniform cycloid scales.	...	...	...

A ROUGH KEY TO THE IDENTIFICATION OF INDIAN OPHIDIA—*contd.*

	No. of Sub-caudals.	No. of Ventrals.	Shape of Pupil of Eye.	No. of Upper Labials.	Other Criteria.
C.—15 ROWS OF SCALES ROUND THE BODY.					
<i>Rhinophis sanguineus</i> ...	5—10	182—214	Eye in the ocular shield.	4th labial in contact with parietal.	Tail ending in a large convex rugose shield.
<i>Silybura macrolepis</i> ...	7—9	128—140	Do.	" "	Tail ending in a small shield, bicuspid, the points side by side, or square.
<i>Pseudoplectrurus canariensis</i> ...	6—13	172—188	Do.	" "	Tail compressed, terminal shield with two superposed single or bifid points.
<i>Plectrurus perroteti</i> ...	7—12	152—165	Do.	" "	Do. do. do.
" <i>davisoni</i> ...	7—12	180	Do.	" "	Do. do. do.
" <i>guentheri</i> ...	10—12	171—175	Do.	" "	Do. do. do.
" <i>aureus</i> ...	8—12	164—177	Do.	" "	Do. do. do.
<i>Melanophidium wynadense</i> ...	10—15	170—185	Do.	" "	Do. do. do.
" <i>bilineatum</i> ...	15—17	188—200	Do.	" "	Tail cylindrical or slightly compressed, the terminal shield pointed or with one or two vertical ridges.
" <i>punctatum</i> ...	15—18	184—198	Do.	" "	Do. do. do.
<i>Platyplectrurus sanguineus</i> ...	5—9	120—150	Do.	" "	Do. do. do.
" <i>trilineatus</i> ...	8—16	163—175	Do.	" "	Do. do. do.
" <i>madurensis</i> ...	10—15	158—175	Do.	" "	Do. do. do.
<i>Aspidura trachyroprocta</i> ...	13—25	120—147	Do.	" "	Do. do. do.
<i>Xylophis stenorhynchus</i> ...	17—31	120—131	Do.	" "	Do. do. do.
<i>Xenopeltis unicolor</i> ...	26—31	166—193	Do.	" "	Do. do. do.
<i>Simotes torquatus</i> ...	27—34	150—169	Do.	" "	Do. do. do.
<i>Oligodon brevicauda</i> ...	25—29	173—195	Do.	" "	Do. do. do.
" <i>sublineatus</i> ...	26—35	136—159	Do.	" "	Do. do. do.
" <i>elliotti</i> ...	29	152	Do.	" "	Do. do. do.
" <i>templetonii</i> ...	31	135	Do.	" "	Do. do. do.
" <i>dorsalis</i> ...	47—51	174—177	Do.	" "	Do. do. do.

38—56	160—218	Do.	...	7,	"	"	"
28—34	113—135	Vertically sub-elliptic	...	6,	"	"	"
33—38	127—135	Do.	...	7,	"	"	"
32—39	200—234	Round	...	7,	"	"	"
35—40	224—235	Do.	...	7,	"	"	"
40—51	200—220	Do.	...	7,	"	"	"
44—51	220—237	Do.	...	7,	"	"	"
37—56	212—225	Do.	...	7,	"	"	"
34—46	150—176	Vertically elliptic	...	6, 3rd and 4th or 3rd, 4th and 5th entering eye.	"	"	"
38—46	153—155	Do.	...	7, seventh very long.	"	"	"
...	...	Do.	...	7,	"	"	"
...	164	Do.	...	7,	"	"	"
70—87	188—194	Do.	...	7, 4th or 4th and 5th entering eye.	"	"	"
48—56	134—140	Vertical	...	7 or 8, a loreal pit.	"	"	"
59—63	210—217	Vertically elliptic	...	6 or 7, 3rd and 4th entering eye.	"	"	"
75—83	200—234	Do.	...	7, 3rd and 4th entering eye.	"	"	"
50—75	178—195	Round	...	6,	"	"	"
64—76	130—154	Do.	...	7,	"	"	"
77—80	173—187	Do.	...	8, 4th and 5th	"	"	"
87—96	151—163	Do.	...	7, 3rd and 4th	"	"	"
78—82	211—231	Vertically elliptic	...	7,	"	"	"
70—82	138—140	Horizontal	...	8 (rarely 9), 4th and 5th entering eye.	"	"	"
90—105	142—151	Do.	...	8, 5th entering eye.	"	"	"
120—151	190—195	Do.	...	7, or 8, 5th or 6th entering eye.	"	"	"
129—145	162—177	Round	...	8, 4th and 5th entering eye	"	"	"
167—203	203—234	Horizontal	...	9, 4th, 5th and 6th entering eye.	"	"	"
140—166	172—188	Do.	...	8, 5th entering eye.	"	"	"
151—173	182—194	Do.	...	8,	"	"	"
117	174—176	Round	...	9, 4th, 5th and 6th entering eye.	"	"	"
110—150	167—205	Do.	...	9, or 10 (rarely 8), 5th and 6th, or 4th, 5th and 6th entering eye.	"	"	"
74—105	167—177	Do.	...	8, 5th only entering eye.	"	"	"
144—155	154—171	Do.	...	9, 5th and 6th entering eye.	"	"	"
123—137	193—205	Round	...	8, 4th and 5th entering eye.	"	"	"

Length 5 feet.

D.—10 ROWS OF SCALES
ROUND THE BODY.

Zaocys nigromarginatus

A ROUGH KEY TO THE IDENTIFICATION OF INDIAN OPHIDIA—*contd.*

E.—17 ROWS OF SCALES ROUND THE BODY.	No. of Sub- caudals.	No. of Ven- trals.	Shape of Pupil of Eye.	No. of Upper Labials.	Other Criteria.
Rhinophis—5 species ...	3—7	148—223	Eye in the ocular shield...	.....	Tail ending in a large con- vex rugose shield.
Silybura—18 species ...	6—13	122—234	Do. do.	.....	Tail ending in a small square or bicuspid shield.
Oligodon—3 species ...	25—37	129—162	Round ...	7, upper labials, 3rd and 4th enter- ing eye.	No pterygoid teeth.
Simotes—6 species ...	30—61	148—202	Do. ...	6, 7, or (mostly) 8 upper labials ...	Maxillary teeth 8—12, pos- terior ones enlarged.
Aspidura—3 species ...	19—38	101—154	Do. ...	6, upper labials, 4th entering eye...	Maxillary teeth 20, small, equal.
Gerardia prevostiana ...	31—34	146—158	Vertically sub-elliptic ...	8, " 4th " "	
Anistrodon hypnale ...	31—45	140—155	Do. do.	7 or 8, and a loreal pit.	
Azeimops fene ...	42	180	Vertically elliptic	6, 3rd entering orbit.	
Psammodynastes pulverulentus	45—65	146—175	Do. do.	8, 3rd, 4th and sometimes 5th en- tering eye.	Anal entire.
Lycodon striatus ...	42—62	153—178	Do. do.	8, 3rd, 4th and 5th entering eye ...	Anal divided.
Haplrocercus ceylonensis ...	42—56	177—207	Round	7, 4th or 3rd and 4th entering eye.	
Polyodontophis subpunctatus ...	47—76	151—220 (240)	Do. ...	9 or 10, 5th and 6th or 4th, 5th and 6th entering eye.	
Trimeresurus trigonocephalus ...	57—67	147—152	Vertically elliptic	9 or 10, and loreal pit.	
Lycodon fara, amabilis, trau- vancoricus, aulicus, atropur- pureus,	56—91	167—255	Do. do.	9 or 10, 3rd, 4th and 5th entering eye.	
Polyodontophis sagittarius ...	56—70	205—228	Round ...	7 or 8, 3rd and 4th or 4th and 5th entering eye.	
" bistrigatus ...	73—75	184—186	Do. ...	10, 4th, 5th and 6th entering eye.	
Lycodon septentrionalis and fas- ciatus.	83—90	213—214	Vertically elliptic	8, 3rd, 4th and 5th entering eye.	
Polyodontophis collaris ...	102—131	159—190	Round ...	9 or 10, 4th, 5th and 6th entering eye.	

<i>Pseudocyclophis olivaceus</i> ...	68—73	206—215	Vertically elliptic	... 5, 3rd entering eye.	...	...
" bicolor	58—77	199—213	Do.	...	...	...
<i>Pseudoxenodon macrops</i> ...	60—75	160—173	Round	... 8, 4th and 5th entering eye.	...	...
<i>Tropidonotus punctulatus</i> ...	62—83	142—154	Do.	... 9 (rarely 10), 4th and 5th (or 5th and 6th) entering eye.	...	...
<i>Dipsas multimaculata</i> ...	80—106	202—235	Vertically elliptic	... 8, 3rd, 4th and 5th entering eye.	...	Length 3 feet.
<i>Ahalates nicobariensis</i> ...	87	189	Round	... 7, 3rd and 4th entering eye.	...	...
<i>Psammodphis condanarus</i> and longifrons.	75—90	156—182	Do.	... 8, 4th and 5th entering eye	...	Length 6 feet.
<i>Zamenis mucosus</i> ...	95—135	190—208	Do.	... 8, or 9, 4th and 5th or 5th and 6th entering eye.	...	...
<i>Psammodphis lethii</i> ...	82—138	177—188	Do.	... Upper labials, 9 or 10, 5th and 6th or 4th, 5th and 6th entering eye.	...	...
<i>Chrysopalet ornata</i> ...	118—138	204—236	Do.	... 8, 4th entering eye.	...	...
<i>Xenelaphis hexagonotus</i> ...	140—179	185—198	Do.	...	...	...
F.—18 ROWS OF SCALES ROUND THE BODY.						
<i>Typhlops beddomii</i> , porrectus, minor, and andamanensis.	Uniform cycloid body.	scales over	Eyes under shields	... 4.	...	...
G.—19 ROWS OF SCALES ROUND THE BODY.						
<i>Cylindrophis rufus</i> and maculatus	4—10	185—245	Pupil round or vertically sub-elliptic.	... 6, 3rd and 4th entering eye.	...	...
<i>Uropeltis grandis</i> ...	6—9	129—147	Eye in the ocular shield...	....	...	Tail obliquely truncated and ending in large rugose, flat shield.
<i>Rhinophis oxyrhynchus</i> and punctatus.	5—7	217—246	Do. do.	...	...	Tail not obliquely truncated and ending in large, rugose, convex shield.
<i>Silybura grandis</i> , nigra and broughami.	6—12	163—230	Do. do.	...	...	Tail obliquely truncated and ending in small square or bicuspid shield.
<i>Distira jerdonii</i> ...	...	224—238	...	... 5, 3rd and 4th entering eye	...	(Marine.) Tail strongly compressed.
<i>Platurus laticaudatus</i> ...	25—45	220—240	...	... 7 or 8, "	...	do.
<i>Hypsirhina plumbea</i> ...	29—46	120—134	Vertically elliptic	... 8, 4th and 5th entering eye	...	(Aquatic.)
<i>Simotes cyclurus</i> ...	38—48	156—210	Round	... 8, "	...	...

A ROUGH KEY TO THE IDENTIFICATION OF INDIAN OPHIDIA—*contd.*

	No. of Sub-caudals.	No. of Ventrals.	Shape of Pupil of Eye.	No. of Upper Labials.	Other Criteria.
<i>Lytorhynchus paradoxus</i> ...	40—53	169—175	Vertically elliptic	... 8, 5th entering eye.	
<i>Psammodynastes pulverulentus</i> , ...	45—65	146—175	Do.	... 8, 3rd, 4th and (sometimes) 5th entering eye.	
<i>Timoniscus gramineus</i> , <i>anamallensis</i> and <i>trigonocephalus</i> .	44—75	138—175	Do.	... 9, 10 or 12 (loreal pit).	
<i>Tropidonotus ceylonensis</i> ...	48—54	133—141	Round	... 8, 4th and 5th entering eye.	
<i>Lyodon carinatus</i> ...	53—64	188—195	Vertically elliptic	... 9, 3rd, 4th and 5th entering eye.	
<i>Simotes albocinctus</i> ...	53—69	177—203	Round	... 7, 3rd and 4th entering eye.	
<i>Abiales porphyraeus</i> ...	52—76	192—215	Do.	... 8, 4th and 5th entering eye.	Anal divided.
<i>Tropidonotus stolidus</i> ...	50—85	125—161	Do.	... 8, 3rd, 4th and 5th entering eye.	(Aquatic.)
<i>Helicops schistosus</i> ...	55—85	129—151	Do.	... 8 or 9, 3rd and 4th or 4th and 5th entering eye.	(Aquatic.)
<i>Cantoria violacea</i> ...	56—64	266—278	Vertically sub-elliptic	... 5 ...	(Aquatic.)
<i>Xenochrophis cerasogaster</i> ...	60—79	140—151	Round	... 9, 4th (rarely 5th) entering eye.	Anal divided.
<i>Tropidonotus khasiensis</i> , <i>beddomii</i> , <i>parallelus</i> , <i>chrysargus</i> , <i>nigrocinereus</i> , <i>subminiatus</i> , <i>timavianus</i> , <i>monticola</i> , <i>piscator</i> , <i>bellulus</i> , <i>saucijohannis</i> , <i>Coluber reticularis</i> ...	60—100	125—175	Do.	... 8 or 9 ...	
<i>Zamenis ventrimaculatus</i> ...	65—76	213—232	Do.	... 8, 4th and 5th entering eye	Anal undivided.
... <i>ladacensis</i> ...	82—119	193—255	Do.	... 9, 5th and 6th ...	Anal divided.
... <i>karelinii</i> ...	75—107	177—235	Do.	... 8, 3rd, 4th and 5th entering eye ...	" "
<i>Tropidonotus platyceps</i> ...	96—122	154—168	Do.	... 9, 4th, 5th and 6th entering eye ...	" "
... <i>modestus</i> ...	85—109	193—242	Do.	... 9, 3rd to 6th entering eye ...	" "
<i>Coluber radiatus</i> and <i>melanurus</i> .	101 pairs	214	Vertically elliptic	... 8, 3rd, 4th and 5th entering eye.	Anal undivided.
<i>Lyodon ganniei</i> ...	100—107	138—206	Round	... 9, 4th, 5th and 6th entering eye.	
<i>Coluber prasinus</i> ...	120—121	203—204	Do.	... 9 (or 8), 4th, 5th and 6th entering eye.	
<i>Coluber irenaus</i> ...					
H.—20 ROWS OF SCALES					
ROUND THE BODY.					
<i>Cyphlops braminus</i> ...	Uniform	cycloid scales	Eyes under shields	... 4.	
... over body.					

I.—21 ROWS OF SCALES
ROUND THE BODY.

	4—10	185—245	Round or vertically sub-elliptic.	6 upper labials, 3rd and 4th entering eye.	Head covered with scales.
<i>Cylindrophis rufus</i> and maculatus.	21—57 pairs.	132—156	Vertically elliptic	8 or 9, and loreal pit	Head covered with scales.
<i>Trimeresurus monticola</i> ...	31—49 "	136—145	Do. do.	9 or 10, " "	" "
" <i>strigatus</i> ...	42—67 "	164—187	Do. do.	7 " "	" "
" <i>jerdoni</i> ...	53—75 "	145—175	Do. do.	9 to 12 " "	" "
" <i>grammurus</i> ...	53—75 "	144—166	Do. do.	6 to 7 " "	Head with large shields.
<i>Ancistrodon himalayanus</i> ...	35—51 "	195—240	Do. do.	5, 3rd and 4th entering eye.	Tail strongly compressed.
<i>Platurus colubrinus</i> ...	30—45 "	224—258	Round ...	5, 3rd and 4th entering eye.	(Marine.)
<i>Distira jerdoni</i> ...	38—48 "	136—210	Do. ...	8, 4th and 5th entering eye.	
<i>Smootes splendens</i> and <i>cyclurus</i> .	49—72 "	132—156	Vertically elliptic	9 or 10.	
<i>Cerberus rhynchops</i> ...	60—73 "	159—169	Do. do.	8, 4th entering eye.	Anal undivided.
<i>Hypsirhina enhydris</i> ...	65—76 "	213—232	Round ...	8, 4th and 5th entering eye	Anal divided.
<i>Coluber reticularis</i> ...	73—88 "	197—225	Do. ...	8 " "	Anal undivided.
<i>Zamenis fasciolatus</i> ...	85—100 "	224—232	Do. ...	8 or 9 " "	Anal undivided.
<i>Coluber radiatus</i> ...	79—140 "	202—250	Vertically elliptic	8, 3rd, 4th and 5th entering eye.	
<i>Dipsos trigonatus</i> , <i>barnesi</i> , <i>ceylonicus</i> , <i>gokool</i> , <i>hexagonotus</i> and <i>cyanea</i> .					
<i>Zamenis gracilis</i> ...	118—121 "	213—228	Round ...	9, 5th and 6th entering eye	Anal divided.

J.—22 ROWS OF SCALES
ROUND THE BODY.

Typhlops leucomelas, *jerdoni*, *theobaldianus*, *tenuicollis*, *Body covered with uniform cycloid scales.*

... 4.

K.—23 ROWS OF SCALES
ROUND THE BODY.

	21—57 pairs.	132—156	Vertically elliptic	8 or 9, and loreal pit	Head covered with scales.
<i>Trimeresurus monticola</i> ...	31—49 "	164—187	Do. do.	7, " "	" "
" <i>jerdoni</i> ...	42—67 "	145—175	Do. do.	9 to 12 " "	" "
" <i>grammurus</i> ...	53—75 "	144—166	Do. do.	5 to 7 " "	Head with plates.
<i>Ancistrodon himalayanus</i> ...	35—51 "	154—180	Do. do.	10 to 12 (no loreal pit).	(Marine) Tail strongly com-pressed.
<i>Vipera lebetina</i> ...	42—48 "	195—240	Do. do.	7, 3rd and 4th entering eye.	
<i>Platurus colubrinus</i> ...	30—45 "	144—160	Round ...	8, 4th and 5th "	
<i>Tropidonotus plumbicolor</i> ...	35—50 "	213—223	Do. ...	9 or 10.	
<i>Coronella brachyura</i> ...	46—53 "	132—156	Vertically elliptic		
<i>Cerberus rhynchops</i> ...	49—72 "				

A ROUGH KEY TO THE IDENTIFICATION OF INDIAN OPHIDIA—*contd.*

	No. of Sub- caudals,	No. of Ven- trals,	Shape of Pupil of Eye.	No. of Upper Labials.	Other Criteria.
<i>Zamenis fasciolatus</i>	73—88	197—225	Round	8, 4th and 5th entering eye	Anal divided.
" <i>diadema</i>	65—110	210—278	Do.	10 to 13	Anal entire.
<i>Coluber helena</i>	75—94	220—265	Do.	9 (exceptionally 10 or 11), 5th and 6th or 4th, 5th and 6th entering eye.	" "
" <i>hodgsonii</i>	79—90	233—246	Do.	8, 4th and 5th entering eye	Anal divided.
" <i>taeniurus</i>	90—107	230—284	Do.	9, 5th and 6th	"
L.—24 ROWS OF SCALES ROUND THE BODY.					
<i>Typhlops oatesii</i> , <i>diardi</i> , <i>bothriophryne</i> , <i>rhynchus</i> .	Body covered with uniform cycloid scales.		Eyes under shields	4.	
M.—25 ROWS OF SCALES ROUND THE BODY.					
<i>Echis carinata</i>	21—40	138—185	Vertically elliptic	11 or 12	(Lateral scales serrated).
<i>Fordonia leucobalia</i>	26—41	130—156	Do.	5, 3rd entering eye	(Aquatic.)
<i>Platurus colubrinus</i>	30—45	195—240	Do.	7, 3rd and 4th entering eye.	(Marine.) Tail strongly com-pressed.
<i>Tropidonotus plumbeicolor</i>	35—50	144—160	Round	8, 4th entering eye.	
<i>Hypsirhina blanfordii</i>	45	125	Vertically elliptic	10 to 12—(scales strongly keeled).	
<i>Vipera lebetina</i>	42—48	154—180	Do.	9 or 10—(scales strongly keeled).	Anal entire.
<i>Cerberus rhynchops</i>	49—72	132—156	Do.	11 to 13, with loreal pit.	Anal divided.
<i>Trimeresurus purpureomaculatus</i>	55—75 pairs.	160—182	Do.	10 to 11, " "	
" <i>microsquamatus</i> .	76—92	200—218	Do.	10 to 13	Three or four postoculars.
<i>Zamenis diadema</i> and <i>arenarius</i> .	65—110	210—278	Round	9 (exceptionally 10 or 11), 5 and 6, or 4th, 5th and 6th entering eye.	Two postoculars.
<i>Coluber helena</i> and <i>taeniurus</i>	75—107	220—284	Do.	8 to 11.	
<i>Dipsos forstenii</i>	106—131	259—270	Vertically elliptic	9 or 10, 5th and 6th or 6th and 7th entering eye.	
<i>Coluber oxycephalus</i>	138—149	236—263	Round	" "	

A ROUGH KEY TO THE IDENTIFICATION OF INDIAN OPHIDIA—concl'd.

S.—ABOVE 30 ROWS OF SCALES ROUND THE BODY.	No. of Sub- caudals.	No. of Ven- trals.	Shape of Pupil of Eye.	No. of Upper Labials.	Other Criteria.
<i>Typhlops acutus</i> 28 to 34	Body covered with uniform cycloid scales.		Eyes under shields ... 4.		
<i>Zamenis diadema</i> and <i>arenarius</i> 23 to 31	65—110	210—278	Pupil round ...	... 10 to 13, upper labials.	
<i>Vipera russelli</i> 27 to 31	45—60	103—172	Vertically elliptic ...	... 11 or 12, do.	
<i>Hypsirhina sieboldii</i> 29 to 31	48—56	147—156	Do. do.	... 7 or 8, do.	
<i>Trimeresurus cantonis</i> 27 to 31	55—76	174—184	Do. do.	... 13, upper labials and loreal pit.	
<i>Echis carinata</i> 27 to 31	21—40	133—185	Do. do.	... 11 or 12, upper labials, scales ser- rated.	
<i>Python molurus</i> and <i>reticulatus</i> 60 to 75	60—102	242—330	Vertical ...	... 11 to 13, upper labials, 7th entering eye. Of large size.	
<i>Gongylophis conicus</i> 40 to 47	17—24	163—176	Do. ...	... 12 to 14, upper labials, head covered with small scales.	
<i>Eryx johnii</i> 51 to 65	26—36	194—210	Do. ...	... 10 to 12, do. do.	
<i>Chersydrus granulatus</i> , about 100 at middle of body.	.....	.....	Tail compressed, prehensile.	Head scaled. Aglyphous repre- sentative of the Hydrophids.	
<i>Homalopsis buccata</i> 37 to 47 rows	70 to 85	160 to 171	Pupil vertically elliptic ...	Aquatic Opisthoglypha.	Marine proteroglypha. Tail compressed.
<i>Hypsirhina sieboldii</i> 29 to 31 do.	48 to 56	147 to 156	Do. do.	Do.	
<i>Hipistes hyarinus</i> 35 to 42 do.	22 to 35	153 to 165	Do. do.	Do.	
<i>Enhydris</i> —2 sp. 33 to 42 scales	135 to 200	No ventrals	Scales with feeble tubercle or short keel; juxtaposed.	Scales hexagonal or squarish and juxtaposed.	
<i>Hydrus</i> —1 sp. 45 to 57 do.					
<i>Hydrophis</i> —12 sp. 29 to 50 do.					
<i>Enhydrina</i> —1 sp. 50 to 70 do.	284—314				
<i>Distira</i> —9 sp. (1 below 30) 32 to 53	224—426				
<i>Naia tripudians</i> ...	... 23 to 27 rows across neck.	Subcaudals 49 to 75; Ventrals 170 to 206.		Neck dilatable. Pupil round.	
... 19 to 23	... across body.				
<i>Naia bungarus</i> ...	... 19 to 21 scales across neck.	80 to 117; " 215 to 262.			
... 15 across middle of body.	... across middle of body.				

NOTES ON THE FISH COLLECTION IN THE MUSEUM
OF THE BOMBAY NATURAL HISTORY SOCIETY,
WITH A SYSTEMATIC CATALOGUE.*

By P. W. BASSETT-SMITH, STAFF SURGEON, R.N., F.Z.S.

(Read before the Bombay Natural History Society on Sept. 22nd, 1896.)

On joining the Bombay Natural History Society in November, 1895, I found a very fair collection of fish in the museum, which had been carefully preserved. A large number of these specimens were obtained by Mr. Phipson, C.M.Z.S., some years ago from the fish bunder at Colaba. These have since been slowly added to by gifts from Aden and Colombo, and lately many have been obtained here.

It is however still very far from being anything like a local representative collection, though an excellent nucleus of one, and the Society would only be too glad if members living near the coast and up-country would send specimens with notes concerning them; the fresh-water fish being particularly poorly represented. The fish had not been named, or systematically arranged, and it has given me great pleasure to do these during the last few months, following the nomenclature of "Day" in his Fauna of British India (Fishes), 1889.

A large number of these fish have been collected on the bunder and in the market, and consequently the majority are used for food by some of the teeming population of this city. A considerable number however of the smaller and coarser kinds are eaten only by the lower castes.

The most important families supplying these food fishes being the *Percidæ*, *Cyprinidæ*, *Clupeidæ*, *Mullidæ*, *Sparidæ*, *Polynemidæ*, *Scienidæ*, *Carangidæ*, *Stromateidæ*, *Mugilidæ* and *Pleuronectidæ*, that great genus of temperate climates. The *Gadidæ* (Cod family) is here only represented by a single species, a small fish, *Bregmaceros maccellandi*.

Going down the classified list, the following are the most interesting forms now in the museum, either from peculiarities of structure or quaintness of shape.

* Since this paper was written the two specimens mentioned as doubtfully new have been sent to Mr. Boulenger, F.R.S., of the British Museum, who has kindly identified them as *Percis tertracanthus* which had never been taken in this locality before, the other a specimen of *Discagnathus lamta* with very small barbels.

Mustelus manazo, two young sharks, colourless, evidently taken before birth from the dead mother ; for these fish are viviparous.

Great numbers of small sharks are taken to the market daily and used for food by the poorer class of natives.

The species of *Astrape* represented is a small yellowish flat fish, provided with an electric organ on its upper surface, which is not strong enough to give anything more than a gentle shock, and is probably a "protective organ."

A specimen of *Muraena undulata*, one of the sea eels, is interesting, showing the fish with a small octopus firmly held by its strong teeth (originally the octopus was removed whole from the fish's stomach).

There are two heads of *Muraenesox talabonoides* ; they show the formidable teeth in the jaws, making the name of "eel pike" very suitable. They are used for food, but are coarse eating. The "Siluroid" or scaleless fish, called commonly "Cat fish," are provided with long feelers round the mouth; almost all have strong bony barbed spines at the commencement of the dorsal and pectoral fins, which frequently inflict a serious wound ; those from *Platossus arab* and *Saccobranchus fossilis* are particularly dreaded, though both fish are considered very good eating ; the spines are cut off immediately after the fish is caught ; thus in the market the specimens are always found mutilated. Many of the "Cat fish" are exceedingly ugly to look at ; others which live on the bottom in thick muddy water have the eyes skinned over or almost atrophied. In these the barbels are most numerous, as in *Chaca* and *Exotoma*, neither being represented in the collection.

Among the Carp family there is a species of *Discognathus* represented, which I have been unable to determine. These fish are peculiar in having a semi-circular mouth placed beneath the head and a suctorial disc on the chin. They are found in fresh water.

There is a very good series of *Scatophagus argus* showing variations of marking from quite young to the adult forms, the spots being most distinct in the young forms.

The species of *Scorpcæna*, *Pterois* and *Apistus* are all peculiar in their extraordinary spiny and box-like heads, and also their ragged and elongated fins.

Polycaulis uranoscopus is a small quaint-looking fish with minute eyes looking directly upwards. Two species of that remarkable genus,

Echeneis, are present ; these attach themselves by a sucker-like disc occupying the upper surface of their heads to their "host," generally a shark, but are "commensal parasites, using the larger fish only as a quick means of transit to fresh feeding grounds, and are themselves often taken free" (*Van Benedin*). *Ichthyoscopus inermis*, another remarkable fish, with a disproportionally large head, the eyes looking upwards and the mouth opening vertically. It lives in the mud and is difficult to catch. They are said to make a curious noise "half-snapping, half-croaking."

Platycephalus punctatus, one of the so-called "crocodile fish," very common in Bombay ; it is peculiar in having eye-lids which it can close. *Boleophthalmus*, two species, are represented. These fish live on the surface of the mud and are apparently more often out of the water than in it. They will drown if not allowed to come to the surface. Large numbers of these, with several other kinds of "gobies," are sold in great numbers in the market, evidently much appreciated. *Mustacembelus* and the allied genus, *Rhynchobdella*, or "spiny eels," are elongated fish, peculiar in having a long fleshy snout, living in brackish water, and also said to breathe air direct. Among the most peculiar fish in structure is *Amphisile scutator* from Aden. It is about 4 inches long with a very flattened body, depressed tail and a dorsal cuirass, having its mouth at the end of a long snout. It would appear to be a very indigestible morsel for other predatory fish. There are present two species of the genus *Ophiocephalus*, which are found in fresh-water pools, tanks, wells, etc. This name is given them on account of the snake-like head, covered with large scales. They have accessory gill cavities, being able to exist long periods out of water, also can travel some distance overland, chiefly moving by means of their strong pectoral and caudal fins. They are sometimes found alive buried in mud and are popularly believed by the natives to fall with the rain. *Harpodon nehereus*, another fish, very well known, and largely in demand, both in the fresh and dried state, commonly called "Bombay duck." It is very plentifully taken in the sea near Bombay. The fish is semi-transparent and very flabby when first taken, quickly decomposing. The eyes are yellow, the jaws wide and teeth large.

There is one specimen of the genus *Percis*, which I have been unable to determine and is possibly new. The "Pipe fish" and

“Sea horses” are fairly well represented and are familiar to every one.

The curious “Globe” fishes *Diodon* and *Tetrodon* are also well shown.

The majority of specimens are preserved in spirit, which has the disadvantage of removing the natural colours and imparting a brownish tinge. The last collected ones have been put up in a 5 per cent. solution of *Formol*, which certainly gives the fish a much more real appearance; but even in this the specimens do not maintain the brilliant *ante-mortem* colouring.

I have to thank Mr. Mason for the care he has taken in mounting and labelling the collection.

The total number of genera represented is 115, giving a sum total of 212 species.

Class—PISCES.

Sub-class—CHONDROPTERYGII.

Order I—PLAGIOSTOMATA.

Sub-order—SELACHOIDEI.

Family—*Carchariidæ*.

Genus ... *Mustelus manazo* ... *Bleeker* Bombay.

Family—*Scylliidæ*.

Genus ... *Stegostoma tigrinum* ... *Gmel* (Monkey-mouthed Shark). Bombay.

Sub-order—BATOIDEI.

Family—*Torpedinidæ*.

Genus ... *Astrape dipterygia* ... *Bl. Schn* (Torpedo ray) Bombay.

Family—*Myliobatidæ*.

Genus ... *Myliobatis maculata* ... *Gray* (Devil fish). Bombay.

Sub-class—TELEOSTEI.

Order—PHYSOSTOMI.

Family—*Murænidæ*.

Genus ... 1 *Muræna tessellata* ... *Richardson* (Sea eel) Bombay.

M. undulata ... *Lacép* „

Genus ... 2 *Murænesox talabonoides* *Bleeker* (eel pike). Bombay.

Family—*Siluridæ*—(Cat fish).

<i>Genus</i>	... 1	<i>Plotosus arab</i>	... <i>Forsk</i>	... Bombay.
<i>Genus</i>	... 2	<i>Saccobranchus fossilis.</i>	... <i>Bloch</i>	... „
<i>Genus</i>	... 3	<i>Macrones seenghala</i>	... <i>Sykes</i>	... „
		<i>M. bleekeri</i>	... <i>Day</i>	... Bombay.
		<i>M. gulio</i>	... <i>Ham. Buch</i>	... „
<i>Genus</i>	... 4	<i>Rita buchanani</i>	... <i>Bleeker</i>	... „
<i>Genus</i>	... 5	<i>Arius sona</i>	... <i>Ham. Buch</i>	... „
<i>Genus</i>	... 6	<i>Osteogeniosus militaris</i>	... <i>Linn.</i>	... „
<i>Genus</i>	... 7	<i>Glyptosternum trilineatum</i>	... <i>Blyth</i>	... Belgaum.

Family—*Cyprinidæ*.Sub-family—*Cobitidinae* (Loaches).

<i>Genus</i>	... 1	<i>Nemachilus evezardi</i>	... <i>Day</i>	... Khandala.
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Sub-family—*Cyprininae* (Carps).

<i>Genus</i>	... 1	<i>Homaloptera</i> , sp.	...	
<i>Genus</i>	... 2	<i>Discognathus lamta</i>	... <i>Ham. Buch</i>	... B'bay dist.
		<i>D.</i> sp.	...	... „ „
<i>Genus</i>	... 3	<i>Barbus sarana</i>	... <i>Ham. Buch</i>	... „ „
		<i>B. conchoni</i>	... <i>Ham. Buch</i>	... „ „
		<i>B. carnaticus</i>	... <i>Jerdon</i>	... Poona.
		<i>B. amphibius</i>	... <i>Cuv & Val</i>	... Vehar.
		<i>B. malabaricus</i>	... <i>Jerdon</i>	... Poona.
		<i>B. tor</i>	... <i>Ham. Buch</i> (Mah-seer)	... Vehar.
<i>Genus</i>	... 4	<i>Cirrhina latia</i>	... <i>Ham. Buch</i>	... B'bay dist.
<i>Genus</i>	... 5	<i>Danio chrysops</i>	... <i>Cuv & Val</i>	... „ „
<i>Genus</i>	... 6	<i>Rasbora daniconius</i>	... <i>Ham. Buch</i>	... „ „
		<i>R. buchanani</i>	... <i>Bleeker</i>	... Vehar.
<i>Genus</i>	... 7	<i>Aspidoparia morar</i>	... <i>Ham. Buch</i>	... Bombay.

Family—*Clupeidæ* (Herrings).

<i>Genus</i>	... 1	<i>Clupea ilisha</i>	... <i>Ham. Buch</i>	... Bombay.
		<i>C. lile</i>	... <i>Cuv & Val</i>	... „
<i>Genus</i>	... 2	<i>Chatoessus nassus</i>	... <i>Bloch</i>	... „
		<i>C. chacunda</i>	... <i>Ham. Buch</i>	... „

<i>Genus</i>	... 3	<i>Engraulis</i>	<i>commer-</i>			
		<i>sonianus</i>	...	<i>Lacép.</i>	...	Bombay.
		<i>E. purava</i>	...	<i>Cuv & Val</i>	...	"
<i>Genus</i>	... 4	<i>Coilia</i>	<i>dussumieri</i>	...	<i>Cuv & Val</i>	...
<i>Genus</i>	... 5	<i>Dussumeiria</i>	<i>hasseltii</i>	...	<i>Bleeker</i>	(Sardine).
		<i>D. acuta</i>	...	<i>Cuv. & Val</i>	...	
		Family— <i>Scopelidæ</i> .				
<i>Genus</i>	... 1	<i>Saurida</i>	<i>tumbil</i>	...	<i>Bloch</i>	... Bombay.
<i>Genus</i>	... 2	<i>Harpodon</i>	<i>nehereus</i>	...	<i>Ham. Buch</i>	(Bombay duck) ... Bombay.
		Family— <i>Cyprinodontidæ</i> .				
<i>Genus</i>	... 1	<i>Haplochilus</i>	<i>lineatus</i>	...	<i>Cuv & Val.</i>	... Bombay.
		Family— <i>Scombresocidæ</i> .				
<i>Genus</i>	... 1	<i>Belone</i>	<i>strongylora</i>	...	<i>Hasselt</i>	(gar fish). Bombay.
<i>Genus</i>	... 2	<i>Exocetus</i>	<i>mento</i>	...	<i>Cuv & Val</i>	(flying fish) ... Persian Gulf.
		<i>E. pœcilopterus</i>	...	<i>Cuv & Val.</i>	...	"
		Order II—ACANTHOPTERYGII.				
		Sub-order—PERCIFORMES.				
		Family— <i>Percidæ</i> .				
<i>Genus</i>	... 1	<i>Lates</i>	<i>calcarifer</i>	...	<i>Bloch</i>	(cock-up fish) ... Bombay.
<i>Genus</i>	... 2	<i>Serranus</i>	<i>sonnerati</i>	...	<i>Lacép</i>	(rock cod). "
		<i>S. diacanthus</i>	...	<i>Cuv & Val</i>	...	"
		<i>S. morrhua</i>	...	<i>Cuv & Val</i>	...	"
		<i>S. fuscoguttatus</i>	...	<i>Forsk</i>	...	"
		<i>S. lanceolatus</i>	...	<i>Bloch</i>	...	"
		<i>S. salmoides</i>	...	<i>Lacép</i>	...	"
		<i>S. maculatus</i>	...	<i>Bl</i>	...	"
		<i>S. bænaack</i>	...	<i>Bloch</i>	...	"
<i>Genus</i>	... 3	<i>Lutjanus</i>	<i>kasmira</i>	...	<i>Forsk</i>	...
		<i>L. gibbus</i>	...	<i>Forsk</i>	...	"
		<i>L. johnii</i>	...	<i>Bloch</i>	...	"
		<i>L. annularis</i>	...	<i>Cuv & Val</i>	...	"
		<i>L. lineolatus</i>	...	<i>Rupp</i>	...	"
		<i>L. rivulatus</i>	...	<i>Cuv & Val</i>	...	"

<i>Genus</i>	...	L.	argentimaculatus	...	<i>Forsk</i>	...	...	Bombay.
		L.	roseus	...	<i>Day</i>	...	...	"
<i>Genus</i>	...	4	Ambassis gymnocephalus	...	<i>Lacep</i>	...	...	"
<i>Genus</i>	...	5	Apogon multitæniatus	...	<i>Cuv. & Val</i>	...	...	"
		A.	elliotti	...	<i>Day</i>	...	...	"
		A.	frenatus	...	<i>Val</i>	...	...	"
<i>Genus</i>	...	6	Therapon jarbua	...	<i>Forsk</i>	(bell fish)	...	"
		T.	quadriliniatus	...	<i>Bloch</i>	...	...	"
		T.	theraps	...	<i>Cuv & Val</i>	...	...	"
<i>Genus</i>	...	7	Pristipoma guoraca	...	<i>Cuv & Val</i>	...	...	"
		P.	hasta	...	<i>Bloch</i>	...	...	"
<i>Genus</i>	...	8	Diagramma griseum	...	<i>Cuv & Val</i>	...	...	"
<i>Genus</i>	...	9	Scolopsis vosmeri	...	<i>Bloch</i>	...	...	"
		S.	ghanam	...	<i>Forsk</i>	...	...	"
<i>Genus</i>	...	10	Lobotes surinamensis	...	<i>Bloch</i>	...	...	"
<i>Genus</i>	...	11	Gerres filamentosus	...	<i>Cuv</i>	...	...	"
		G.	lucidus	...	<i>Cuv & Val</i>	...	...	"
		G.	oyena	...	<i>Forsk</i>	...	...	"
Family— <i>Squamipinnæ</i> .								
<i>Genus</i>	...	1	Chætodon trifasciatus	...	<i>Mugo Park</i>	...	...
		C.	auriga	...	<i>Forsk</i>	...	...
		C.	vagabundus	...	<i>Linn</i>	...	...
		C.	collaris	...	<i>Bloch</i>	...	...
<i>Genus</i>	...	2	Heniochus macrolepidotus	...	<i>Linn</i>	...	...
<i>Genus</i>	...	3	Holacanthus diacanthus	...	<i>Bl. Schn</i>	...	...	Bombay & Ceylon.
		H.	nicobariensis	...	<i>Bl. Schn</i>	...	...	Ceylon.
<i>Genus</i>	...	4	Scatophagus argus	...	<i>Bloch</i>	...	...	Bombay.
<i>Genus</i>	...	5	Drepane punctata	...	<i>Gmel</i>	...	...	"
Family— <i>Mullidæ</i> .								
<i>Genus</i>	...		Upeneoides sulphureus	...	<i>Cuv & Val</i>	...	...	Bombay.
		U.	vittatus	...	<i>Forsk</i>	...	...	Ceylon.

Family—*Sparidae*.

<i>Genus</i>	...	<i>Chrysophrys datwia</i>	...	<i>Ham Buch</i>	...	Bombay.
		C. bifasciata	...	<i>Forsk</i>	...	„
		C. berda	...	<i>Forsk</i>	...	„

Family—*Scorpenidae*.

<i>Genus</i>	...	1 <i>Scorpena armata</i>	...	<i>Sauv</i>	...	Bombay.
<i>Genus</i>	...	2 <i>Pterois russellii</i>	...	<i>Bennett</i>	(cock fish)	„
		P. miles	...	<i>Bennett</i>	...	„
		P. volitans	...	<i>Linn.</i>	...	Aden.
<i>Genus</i>	...	3 <i>Apistus carinatus</i>	...	<i>Bl. Schn</i>	...	„
<i>Genus</i>	...	4 <i>Minous monodactylus</i>	...	<i>Bl. Schn</i>	...	Bombay.
<i>Genus</i>	...	5 <i>Polycaulis uranoscopus</i>	...	<i>Bl. Schn</i>	...	„

Family—*Teuthididae*.

<i>Genus</i>	...	<i>Teuthis java</i>	...	<i>Linn</i>	...	Bombay.
		T. stellata	...	<i>Forsk</i>	...	Aden.
		T. oramin	...	<i>Günth</i>	...	Bombay.

Family—*Berycidae*.

<i>Genus</i>	...	<i>Holocentrum diadema</i>	...	<i>Lacép</i>	...	Bombay.
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Family—*Kurtidae*.

<i>Genus</i>	...	<i>Pempheris russellii</i>	...	<i>Day</i>	...	Ceylon.
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Family—*Polynemidae*.

<i>Genus</i>	...	<i>Polynemus sextarius</i>	...	<i>Bloch</i>	(mango fish.)	Bombay.
		P. heptadactylus				
		juv	...	<i>Day</i>	...	„
		P. tetradactylus	...	<i>Shaw</i>	...	„
		P. indicus	...	<i>Shaw</i>	...	„

Family—*Sciaenidae*.

<i>Genus</i>	...	1 <i>Sciaena maculata</i>	...	<i>Bl. Schn</i>	...	Bombay.
		S. ossea	...	<i>Day</i>	...	„
		S. glauca	...	<i>Day</i>	...	„
		S. aneus	...	<i>Bloch</i>	...	„
<i>Genus</i>	...	2 <i>Sciaenoides brunneus</i>	...	<i>Day</i>	...	„

Family—*Trichiuridae*.

<i>Genus</i>	...	<i>Trichiurus savala</i>	...	<i>Cuv & Val</i>	(scabbard fish.)	Bombay.
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Family—*Acanthuridae*.

<i>Genus</i>	...	<i>Acanthurus xanthurus</i>	...	<i>Blyth</i>	...	Red Sea.
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Genus	... A.	lineatus	... Gmelin	... Bombay.
	A.	matoides	... Cuv. & Val	... „

Family—*Carangidae*.

Genus	... 1	Caranx	rottileri	... Bloch	... Bombay.
		C.	kurra...	... Cuv & Val	... „
		C.	kalla	... Cuv & Val	... „
		C.	cjedaba	... Forsk	... „
		C.	armatus	... Forsk	... „
		C.	atropus	... Bl. Schn.	... „
		C.	malabaricus	... Bl. Schn.	... „
		C.	gallus...	... Linn	... „

Genus	... 2	Chorinemus	moadetta...	Cuv & Val	... „
		C.	lysan	... Forsk	... „

Genus	... 3	Platax	teira	... Forsk	... „
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Genus	... 4	Psenes	javanicus	... Cuv & Val	... „
		P.	indicus	... Day	... „

Genus	... 5	Equula	insidiatrix	... Bloch	... „
		E.	blochii	... Cuv & Val	... „
		E.	daura	... Cuv	... „
		E.	edentula	... Bloch	... „

Family—*Stromateidae*.

Genus	...	Stromateus	cinereus,	Bloch	... Bombay.
		S.	niger	... Bloch	... „

Family—*Scombridae*.

Genus	... 1	Scomber	microlepidotus	Rupp	... Bombay.
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Genus	... 2	Cybium	guttatum	... Bl. Schn	(seer fish) „
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Genus	... 3	Elacate	nigra...	... Bloch	... „
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Genus	... 4	Echeneis	albescens	... Temm	(sucker fish) „
		E.	naucrates	... Linn.	... „

Family—*Uranoscopidae*.

Genus	...	Ichthyoscopus	inermis	... Cuv & Val	... Bombay.
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Family—*Trachinidae*.

Genus	... 1	Sillago	sihama	... Forsk	(Lady fish). Bombay.
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Genus	... 2	Percis,	sp.	...	„
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Family—*Batrachidae*.

Genus	...	Batrachus	grunniens	... Bloch	(Toad fish). Bombay.
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Family—*Pedicutali*.

- Genus* ... *Antennarius hispidus* ... *Bl. Schn* (Angler fish) ... *Bombay*.

Family—*Cottidæ*.

- Genus* ... 1 *Platycephalus punctatus* ... *Cuv & Val* (Crocodile fish) ... *Bombay*.
- Genus* ... 2 *Trigla*, sp. ... (gurnard) ... *Ceylon*.

Family—*Cataphracti*.

- Genus* ... *Dactylopterus orientalis*... *Cuv & Val* ... *Aden*.

Family—*Gobiidæ*.

- Genus* ... 1 *Gobius macrostoma* ... *Steind* ... *Bombay*.
- G. *viridipunctatus*.. *Day* "
- G. *ocellatus* ... *Day* "
- G. *masoni* ... *Day* "
- G. *striatus* ... *Day* "
- G. *ornatus* ... *Rupp* "
- G. *giuris* ... *Ham. Buch.* "
- Genus* ... 2 *Boleophthalmus bod-daerti* ... *Pall.* ... *Bombay*.
- B. *dentatus*... *Cuv & Val.* "
- Genus* ... 3 *Eleotris caperata* ... *Cantor* "
- E. *fusca* ... *Forsk.* "
- Genus* ... 4 *Trypauchen vagina* ... *Bl. Schn* "

Family—*Callionymidæ*.

- Genus* ... *Callionymus sagitta* ... *Pall.* (Dragonet). *Bombay*.

Family—*Blenniidæ*.

- Genus* ... 1 *Salarias fuscus* ... *Rupp* ... *Bombay*.
- S. *lineatus* ... *Cuv & Val.* "
- Genus* ... 2 *Petroscirtes punctatus*... *Cuv & Val.* "
- Genus* ... 3 *Blennius steindachneri*. *Day* "

Family—*Rhynchobdellidæ*.

- Genus* ... 1 *Rhynchobdella aculeata*. *Bloch* (Spined eel.) *Bombay*.
- Genus* ... 2 *Mustacembellus guentheri*... *Day* "
- M. *pancalus*... *Ham. Buch* "

Family—*Mugilidæ*.

<i>Genus</i>	... Mugil waigiensis	... Q. & G. (grey mullet)	Bombay.
	M. dussumieri	... Cuv & Val.	... "

Family—*Centriscidæ*.

<i>Genus</i>	... Amphisile scutata	... Linn.	... Aden.
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Family—*Ophiocephalidæ*.

<i>Genus</i>	... Ophiocephalus punctatus	... Bloch	... { Bombay. Secunder- abad.
	O. gachua	... Ham. Buch	... Bombay.

Family—*Labyrinthici*.

<i>Genus</i>	... 1 Polyacanthus (cupanus)	... Cuv & Val.	... Bombay.
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<i>Genus</i>	... 2 Anabas scandens	... Day	... "
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Family—*Glyphidodontidæ*.

<i>Genus</i>	... 1 Tetradrachmum aruanum	... Linn.	... Red Sea.
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<i>Genus</i>	... 2 Pomacentrus lividus	... Forster	...
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<i>Genus</i>	... 3 Glyphidodon bengalensis	... Cuv & Val.	... Bombay.
	G. cochiniensis	... Day	... "

Family—*Labridæ* (Wrasses).

<i>Genus</i>	... 1 PlatyGLOSSUS dussumieri	... Cuv & Val.	... Bombay.
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<i>Genus</i>	... 2 Novacula punctulata	... Cuv & Val.	... Ceylon.
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<i>Genus</i>	... 3 Julis lunaris	... Linn.	... "
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<i>Genus</i>	... 4 Pseudoscarus æruginosus	... Cuv & Val.	... Bombay.
	P. erythrodon	... Cuv & Val.	... "
	P. ghobbam	... Forsk	... "

Family—*Chromides*.

<i>Genus</i>	... Etroplus suratensis	... Bloch	...
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Order III—ANACANTHINI.

Sub-order—ANACANTHINI GADOIDEI.

Family—*Gadidæ*.

<i>Genus</i>	... Bregmaceros maclellandi	... Thomps	... Bombay.
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Sub-order—ANACANTHINI PLEURONECTODIEI.

Family—*Pleuronectidæ*.

<i>Genus</i>	... 1	<i>Pseudorhombus arsius.</i>	<i>Ham. Buch.</i>	... Bombay.
<i>Genus</i>	... 2	<i>Solea ovata</i>	... <i>Richards</i>	... "
<i>Genus</i>	... 3	<i>Synaptura zebra</i>	... <i>Bloch</i>	... "
		S. cornuta ?.	<i>Kaup</i>	... "
		S. orientalis.	<i>Bl. Schn.</i>	... "
<i>Genus</i>	... 4	<i>Cynoglossus elongatus.</i>	<i>Günth</i>	... "
		C. sindensis.	<i>Day</i>	... "
<i>Genus</i>	... 5	<i>Plagusia bilineata</i>	... <i>Bloch</i>	... "

Order IV—LOPHOBANCHII.

Family—*Syngnathidæ*.

<i>Genus</i>	... 1	<i>Syngnathus serratus</i>	... <i>Temm</i> (Pipe fish).	Bombay.
		S. spicifer	... <i>Rüpp</i>	...
<i>Genus</i>	... 2	<i>Gastrotoceus biaculeatus</i>	... <i>Bloch</i> (Pipe fish)	Aden.
		<i>Hippocampus hystrix</i>	... <i>Kaup</i>	...
		H. guttulatus.	<i>Cur</i>	...

Order V—PLECTOGNATHI.

Family—*Sclerodermi*.

<i>Genus</i>	... 1	<i>Balises undulatus</i>	... <i>Mungo Park</i> (File fish)	... Bombay.
		B. maculatus	... <i>Gmel</i>	... "
<i>Genus</i>	... 2	<i>Monacanthus chærocephalus</i>	... <i>Bleeker</i>	... "

Family—*Gymnodontes*.

<i>Genus</i>	... 1	<i>Diodon hystrix</i>	... <i>Linn.</i> (Porcupine fish)	...
<i>Genus</i>	.. 2	<i>Tetrodon lunaris</i>	... <i>Bl. Schn</i> (Globe fish)	... Bombay.
		T. oblongus	... <i>Bloch</i>	... "
		T. patoca	... <i>Ham. Buch</i>	... "
		T. nigropunctatus	... <i>Bl. Schn.</i>	... Ceylon.
		T. reticularis	... <i>Bl. Schn.</i>	... Bombay.
		T. fluviatilis	... <i>Ham. Buch</i>	... "

LIST OF BIRDS COLLECTED DURING FIVE YEARS' RESIDENCE IN THE HYLAKANDY DISTRICT, CACHAR.

PART II.

BY C. M. INGLIS.

(Continued from page 461.)

Family *Dicruridæ*.

Genus *Dicrurus* (Vicill, 1896).

No. 327. *DICRURUS ATER* (Herm.)—The Black Drongo.

Hume, "N and E.," 2nd Ed., Vol. I, p. 198; *Bushanga atra*.—Hume and Dav., "S. F.," Vol. VI, p. 213; Scully, "S. F.," Vol. VIII, p. 270; Vidal, "S. F.," Vol. IX, p. 59; Oates, "S. F.," Vol. X, p. 201; David, "S. F.," Vol. X, p. 366; Hume, "S. F.," Vol. XI, p. 98.

The King Crow, as it is familiarly called, is the commonest Drongo we have. It frequents the open, keeping to gardens and any cultivated land.

36
BENG.
Debehoo.

They imitate the notes of other birds very well, sometimes uttering the loud harsh note of *C. chinensis* and sometimes the lower one of *N. athertoni*. It breeds in May and June, laying from four to five eggs which vary greatly in colour. Some eggs are pure white without any markings, and others are again of a pale salmon-pink, blotched with rufous and pale lilac.

Genus *Chaptia* (Hodgs., 1837).

No. 334. *CHAPTIA ACNEA* (Vicill)—The Bronzed Drongo.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 210; Hume, "S. F.," Vol. II, p. 100; Arms., "S. F.," Vol. IV, p. 320; Hume and Dav., "S. F.," Vol. VI, p. 217; Oates, "S. F.," Vol. VIII, p. 166; Scully, "S. F.," Vol. VIII, p. 272; Bing., "S. F.," Vol. IX, p. 173; Oates, "S. F.," Vol. X, p. 202; Dav., "S. F.," Vol. X, p. 367; Hume, "S. F.," Vol. XI, p. 100.

This species is also very common, but it does not come into gardens like *D. ater*. It frequents the jungle and may be seen on the edge of the cultivation. I found a nest in June, in the fork of a sapling, about 12 feet from the ground, quantity of moss and dried leaves. It contained three eggs.

37
BENG.
Jungle
debehoo.

Genus *Chibia* (Hodgs., 1837).

No. 335. *CHIBIA HOTTENTOTTA* (Linn.)—The Hair-crested Drongo.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 213; Hume, "S. F.," Vol. III, p. 101; Hume and Dav., "S. F.," Vol. VI, p. 222; Oates, "S. F.,"

Vol. VIII, p. 167 ; Scully, "S. F.," Vol. VIII, p. 272 ; Bing, "S. F.," Vol. IX, p. 174 ; Dav., "S. F.," Vol. X, p. 367 ; Hume, "S. F.," Vol. XI, p. 102.

This is the rarest Drongo we have here. Its habits are similar to *D. paradiseus*. Generally it is to be seen in pairs, and has a partiality for Simul (*Bombax* sp.) trees when in flower. This species may easily be recognized from the rest of the *Dicruridae* by the hairs that spring from the back of the head, and by the tips of the tail feathers being slightly curved upwards. It is a very shy bird, by far the shyest of the Drongos.

Genus *Bhringa* (Hodgs., 1837).

No. 339. BHRINGA REMIFER (Temm.)—The Lesser Racket-tailed Drongo.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 216 ; Hume and Dav., "S. F.," Vol. VI, p. 218 ; Oates, "S. F.," Vol. X, p. 202 ; Hume, "S. F.," Vol. XI, p. 100.

This bird is not common here. It keeps to the dense jungle. It generally goes about with a train of followers consisting of *M. rubricapillus*, *T. affinis*, *H. azurea*, &c. It differs from *D. paradiseus* in not having the large crest of the latter, and in having the base of the lateral tail feathers webbed on both sides and not only on the outer one as in *D. paradiseus*.

Genus *Dissemurus* (Gloger, 1842).

No. 340. DISSEMURUS PARADISEUS (Linn.)—The Larger Racket-tailed Drongo.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 217 ; Hume and Dav., "S. F.," Vol. VI, p. 210 ; Oates, "S. F.," Vol. X, p. 203.

This species frequents wooded or bamboo jungle, but in the early morning and in the evening it may be seen hawking insects in the open at the edge of the jungle. When it catches a large insect, such as a locust, it takes it in its claws and tears it to pieces. It has a lovely song and great imitative powers, is easily tamed, and need not be kept confined.

It breeds in April, building a nest of small twigs near the top of any high tree. I have found nearly fully-fledged ones in the beginning of May.

38
BENG.
Chool wallah
Bengraj.

39
BENG.
Chengraj.

40
BENG.
Bengraj.

Wherever this bird is there is nearly sure to be a number of other birds, comprising as a rule *G. pectoralis*, *C. chinensis*, *G. rufulus*, &c.

Family *Sylviidae*.

Genus *Orthotomus* (Horsf., 1821).

No. 374. *ORTHOTOMUS SUTORIUS* (Forst.)—The Indian Tailor-bird.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 231; David and Wenden, "S. F.," Vol. VII, p. 83; Scully, "S. F.," Vol. VIII, p. 305; Brooks, "S. F.," Vol. VIII, p. 476; Dav., "S. F.," Vol. X, p. 390; Reid, "S. F.," Vol. X, p. 45; Hume, "S. F.," Vol. XI, p. 206.

This bird is very common everywhere, frequenting gardens, small jungle, &c.

41
BENG.
Pat-teep-teep
or Potoi.

No. 375. *ORTHOTOMUS ATRIGULARIS* (Temm.)—The Black-necked Tailor-bird.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 235; Hume and Dav., "S. F.," Vol. VI, p. 345; Oates, "S. F.," Vol. X, p. 219; Hume, "S. F.," Vol. XI, p. 206.

I have only once seen a specimen of this bird. I do not know whether it is a permanent resident or not. (It is. E. C. S. B.)

42

Genus *Graminicola* (Jerd., 1863.)

No. 338. *GRAMINICOLA BENGALENSIS* (Jerd.)—The large Grass Warbler.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 249; Hume, "S. F.," Vol. IX, p. 255.

This bird is mentioned by Mr. J. Inglis as common in North-East Cachar, but I have never come across it here in the grass.

43

Genus *Megalurus* (Horsf., 1821).

No. 389. *MEGALURUS PALUSTRIS* (Horsf.)—The Striated Marsh Warbler.

"N. and E.," 2nd Ed., Vol. I, p. 249; Ball, "S. F.," Vol. IV, p. 233; Hume and Dav., "S. F.," Vol. VI, p. 295; Hume, "S. F.," Vol. IX, p. 253; *id.*, Vol. XI, p. 175; Oates, "S. F.," Vol. X, p. 209.

This bird is very common, frequenting grass and reed jungle. It has a habit of flying straight up in the air like a lark, uttering its loud song, then alighting again a short distance off. Although very common, I have never managed to find its nest.

44

Genus *Phylloscopus* (Boie, 1826).

No. 405. PHYLLOSCOPUS AFFINIS (Tickell.)—Tickell's Willow Warbler.

Brooks, "S. F.," Vol. VIII, p. 480 ; Scully, "S. F.," Vol. VIII, p. 306 ; Dav., "S. F.," Vol. X, p. 394 ; Hume, "S. F.," Vol. XI, p. 219.

45 Far from common. I have only managed to get a few specimens.

No. 407. PHYLLOSCOPUS SUPERCILIOSUS (Gmel.)—The Crowned-Willow Warbler.

Oates, "S. F.," Vol. X, p. 223.—*Reguloides superciliosus*.—Brooks, "S. F.," Vol. VII, pp. 128, 236 and 475 ; *id.*, Vol. VIII, p. 480 ; Hume, "S. F.," Vol. XI, p. 222.

46 Very common here, being seen in most trees hunting for insects. Brooks has written very fully on this species.

Genus *Prinia* (Horsf., 1821).

No. 463. PRINIA FLAVIVENTRIS (Deless.)—The Yellow-bellied Wren-Warbler.

Hume, "N. and E.," 2nd Ed., Vol. I., p. 289 ; Oates, "S. F.," Vol. III, p. 340 ; *id.*, Vol. V, p. 158 ; Hume and Dav., "S. F.," Vol. VI, p. 347 ; Doig, "S. F.," Vol. VIII, p. 378 ; Butler, "S. F.," Vol. VIII., p. 386 ; Oates, "S. F.," Vol. X, p. 219 ; Hume, "S. F.," Vol. XI, p. 207.

47 This is a common bird here and frequents grass jungle. The inside of the mouth turns black during the breeding season.

Family *Laniidae*.

Sub-Family *Laniinae*.

Genus *Lanius* (Linn., 1766).

No. 475. LANIUS NIGRICEPS (Frank.)—The Black-headed Shrike.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 315 ; Inglis, "S. F.," Vol. V, p. 29 ; Hume and Dav., "S. F.," Vol. VI, p. 202 ; Cripps, "S. F.," Vol. VII, p. 268 ; Scully, "S. F.," Vol. VIII, p. 264 ; Hume, "S. F.," Vol. XI, p. 89.

This is the commonest Shrike we have got. It frequents the tea gardens and scrub jungle. It has a very harsh note. The natives catch numbers of them in springles, baited with mole-crickets.

No. 477. *LANIUS TEPHRONOTUS* (Vigors).—The Grey-backed Shrike.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 325 ; Inglis, "S. F.," Vol. V, p. 49 ; Hume and Dav., "S. F.," Vol. VI, p. 202 ; Cripps, "S. F.," Vol. VII, p. 267 ; Hume, "S. F.," Vol. VII, p. 374 ; *id.*, Vol. XI, p. 88 ; Scully, "S. F.," Vol. VIII, p. 264 ; Brooks, "S. F.," Vol. VIII, p. 468.

This species is nearly as common as *L. nigriceps* and its habits are just the same.

No. 481. *LANIUS CRISTATUS* (Linn).—The Brown Shrike.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 326 ; Inglis, "S. F.," Vol. V, p. 29 ; Butler, "S. F.," Vol. III, p. 464 ; Dav., "S. F.," Vol. X, p. 365 ; Hume, "S. F.," Vol. XI, p. 92.

This Shrike is comparatively rare here. I think it is a permanent resident, but have never found its nest.

Genus *Tephrodornis* (Swains, 1831.)

No. 486. *TEPHRODORNIS PELVICUS* (Hodgs).—The Nepal Wood-Shrike.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 330 ; Hume, "S. F.," Vol. III, p. 92 ; *id.*, Vol. XI, p. 93 ; Hume, "S. F.," Vol. VI, p. 205.

This is not a common bird, but it is far from being rare. It frequents thick jungle and goes about in small parties. I have never seen them on the ground. They prefer high trees where they hunt for insects. They are not shy birds.

Genus *Pericrocutus* (Boie, 1826.)

No. 490. *PERICROCUTUS SPECIOSUS* (Lath).—The Indian Scarlet Minivet.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 335 ; Sharpe, "S. F.," Vol. IV, p. 206 ; Hume, "S. F.," Vol. V, p. 192 ; Ball, "S. F.," Vol. V, p. 414 ; *id.*, Vol. VII, p. 210 ; Scully, "S. F.," Vol. VIII, p. 268.—*Pericrocutus Elegans*.—Inglis, "S. F.," Vol. V, p. 29 ; Oates, "S. F.," Vol. X, p. 200.

These pretty birds are only found here during the cold weather. In the early morning, when the mist is still hanging, they may be seen flitting over the tea, or else hovering over and settling on some tree in the open ; seen through the mist, they have a beautiful appearance, the mixture of scarlet, orange and yellow, making a lovely blend of colour.

49

5
BENG.
Chota Ker-
ketta.

51

52

I have never seen any here during the hot weather, so I do not think it probable that they breed here.

No. 495. *PERICROCUTUS BREVIROSTRIS* (Vigors).—The short-billed Minivet.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 337; Inglis, "S. F.," Vol. V, p. 29; Hume, "S. F.," Vol. V, p. 187; *id.*, Vol. XI, p. 96; Hume and Dav., "S. F.," Vol. VI, p. 211; Scully, "S. F.," Vol. VIII, p. 268.

53 This species is much smaller than *P. speciosus*. It is slightly the commoner of the two, and it also is only found here during the cold season. Its habits are the same as that species. In colour the males differ from it in being more crimson than scarlet.

Genus *Campophaga* (Vicill, 1816).

No. 505. *CAMPOPHAGA MELANOCHISTA* (Hodgs.).—The Dark-grey Cuckoo-Shrike.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 345.—*Volvocivora melanchistus*.—Inglis, "S. F.," Vol. V, p. 29; Hume, "S. F.," Vol. V, p. 205; Ball, "S. F.," Vol. VII, p. 210; Scully, "S. F.," Vol. VIII, p. 266.

54 This Cuckoo-Shrike is very rare here, and frequents the jungle. They go about in small parties.

Genus *Grauculus* (Cuvier, 1817).

No. 510. *GRAUCULUS MACH* (Less.).—The Large Cuckoo-Shrike.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 348; Hume, "S. F.," Vol. II, p. 204; Ball, "S. F.," Vol. II, p. 400; Inglis, "S. F.," Vol. V, p. 29; Scully, "S. F.," Vol. VIII, p. 267; Dav., "S. F.," Vol. X, p. 366.

55 This bird is very common here during the cold weather. They generally go about in pairs, hunting insects on trees, both in the open and in the jungle.

Sub-Family *Artamineæ*.

Genus *Artamus* (Vicill, 1816).

No. 512. *ARTAMUS FUSCUS* (Vicill).—The Ashy Swallow-Shrike.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 350; Inglis, "S. F.," Vol. V, p. 30; Dav., "S. F.," Vol. X, p. 368; Hume, "S. F.," Vol. XI, p. 103.

56 This species is exceedingly common.

Family *Oriolidæ*.

Genus *Oriolus* (Linn. 1766).

No. 515. *ORIOLOUS TENUIROSTRIS* (Blyth).—The Burmese Black-naped Oriole.

Hume, "S. F.," Vol. III, p. 132 ; *id.*, Vol. VIII, p. 131 ; *id.*, Vol. XI, p. 187 ; Inglis, "S. F.," Vol. V, p. 35 ; Hume and Dav., "S. F.," Vol. VI, p. 329 ; Scully, "S. F.," Vol. VIII, p. 298 ; Oates, "S. F.," Vol. X, p. 212.

This Oriole is very rare. I only once got a specimen here. Its note is different from that of the other Orioles. Curious to say I found this Oriole rather common at Larsingah in the Happy Valley. Larsingah is about 45 miles from Roopacherra. I cannot account for its being so rare in one place and comparatively so common in the other.

57

No. 521. *ORIOLOUS MELANOCEPHALUS* (Linn.).—The Indian Black-headed Oriole.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 359 ; Butler, "S. F.," Vol. III, p. 474 ; Inglis, "S. F.," Vol. V, p. 35 ; Hume, "S. F.," Vol. III, p. 133 ; Dav., "S. F.," Vol. X, p. 388 ; Oates, "S. F.," Vol. X, p. 212.

This Oriole is very common, frequenting the busties or any thinly-wooded place. It may be easily kept in captivity. These Orioles invariably go about in pairs.

58
BENG.
Huldee Pakee
or Teoo.

No. 522. *ORIOLOUS TRAILII* (Vigors).—The Maroon Oriole.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 362 ; Scully, "S. F.," Vol. VIII, p. 299 ; Oates, "S. F.," Vol. X, p. 212 ; Hume, "S. F.," Vol. XI, p. 189.

This species is very rare here, but not so rare as *O. tenuirostris*. I have obtained about a couple of pairs during the five years I have been collecting. Immature birds are, if anything, commoner than the adults. It is the shyest of all the Orioles keeping to the dense jungle.

59
BENG.
Lall Teoo.

Family *Eulabetidæ*.

Genus *Eulabes* (Cuvier, 1817).

No. 525. *EULABES JAVANENSIS* (Os.).—The Malay Grackle.

Inglis, "S. F.," Vol. V, p. 38 ; Hume, "S. F.," Vol. III, p. 152 ; *id.*, Vol. XI, p. 268.

60
BENG.
Tahara
Мyna.

This Grackle is fairly common, but it keeps more to the jungle than near cultivation. It breeds, as a rule, in a hole very high up in a tree, from April to June, laying two or three eggs. Their note is very loud.

Genus *Calornis* (Gray, 1841).

No. 527. CALORNIS CHALYBEIUS (Horsf.)—The Glossy Calornis.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 367; Hume and Dav., "S. F.," Vol. VI, p. 394.—*Colornis affinis*.—Inglis, "S. F.," Vol. V, p. 38.—*Calornis tytleri*.—Hume, "S. F.," Vol. I, p. 480; *id.*, Vol. II, p. 253.

61 This bird is fairly common here. The young are streaked on the lower plumage. The irides in the adults are of a pretty crimson. They go about in small flocks and breed in holes of trees, laying three eggs.

Family *Sturnidae*.

Genus *Sturnia* (Lesson, 1837).

No. 538. STURNIA MALABARICA (Gmel.)—The Grey-headed Myna.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 372; Hume, "S. F.," Vol. XI, p. 265; Dav., "S. F.," Vol. X, p. 401.—*Temenuchus malabaricus*.—Inglis, "S. F.," Vol. V, p. 38.

62
BENG.
Poway.

This myna is exceedingly common, going about in large flocks. These mynas vary greatly in colour, some being of a ruddy tinge on the breast, others only having a fulvous appearance.

Genus *Ampeliceps* (Blyth, 1842).

No. 543. AMPELICEPS CORONATUS (Blyth)—The Gold-crest Myna.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 374; Arms. and Hume, "S. F.," Vol. IV, p. 335; Hume and Dav., "S. F.," Vol. VI, p. 398; Inglis, "S. F.," Vol. IX, p. 256; Hume, "S. F.," Vol. XI, p. 269.

63
BENG.
Huldi matha
Myna.

Only one year I saw this bird, when for some evenings large flocks came into our coolie lines, where there are large clumps of bamboos. I first noticed them from my bungalow, and not being able to recognize them, I went down with my gun and shot a few. They came in flocks of from twenty to fifty, and I think there were six different flocks. When at a distance they kept very high up, but as they came nearer the bamboos they circled round closer and then with one sweep vanished into the bamboos. I had to shoot them when they circled, as after circling they were in the bamboos before one had time to

fire. It was generally so dark when they got near, that I was unable to get as many as I should have liked. I have never seen them again. The young have no yellow on the head ; it gradually appears as they grow older. The two sexes are identical. I kept a fine adult in a cage for some time, and it seemed to take to being confined very easily, but unfortunately after its wing had healed up a servant forgot to close the door of its cage and it got away.

Genus *Acridotheres* (Vicill, 1816).

No. 549. *ACRIDOTHERES TRISTIS* (Linn.)—The Common Myna.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 377 ; Inglis, "S. F.," Vol. V, p. 38 ; Hume and Dav., "S. F.," Vol. VI, p. 398 ; Vidal, "S. F.," Vol. IX, p. 70 ; Dav., "S. F.," Vol. X, p. 400 ; Hume, "S. F.," Vol. XI, p. 262.

This is the commonest myna we have. They breed everywhere in bungalows, holes of trees, &c.

Genus *Æthiopsar* (Sharpe, 1889).

No. 552. *ÆTHIOPSAR FUSCUS* (Wagl.)—The Jungle Myna.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 383.—*Acridotheres fuscus*.—Inglis, "S. F.," Vol. V, p. 38 ; Hume and Dav., "S. F.," Vol. VI, p. 388.

This myna is also very common, but frequents little patches of jungle in the cultivation, though it does sometimes come near houses.

Genus *Sturnopastor* (Hodgs, 1844).

No. 555. *STURNOPASTOR CONTRA* (Linn.)—The Pied Myna.

Hume, "N. and E.," 2nd Ed., Vol. I, p. 386 ; Inglis, "S. F.," Vol. V, p. 38 ; Hume, "S. F.," Vol. XI, p. 261.

This species is also very common. It never builds in the holes of trees like the other mynas.

64

BENG.
Lall Myna,
Bonnie or
Harri harri.

65

BENG.
Choondia
Myna.

66

BENG.
Gobara Myna
or Chirka
harri.

(To be continued.)

THE POISONOUS PLANTS OF BOMBAY.

BY SURGEON-MAJOR K. R. KIRTIKAR, I.M.S., F.L.S.,

CIVIL SURGEON, THANA.

PART XVI.

(With Plate R.)

(Continued from Vol. X, page 502.)

PLUMBAGO ZEYLANICA—(Linn.)

Natural Order—PLUMBAGINÆ.

MARATHI—चित्रक (Chitrak).

An evergreen perennial herb or undershrub, growing in gardens, but not wild, in Thana.

ROOT.—Long, succulent, often much contorted and substantial.

STEM.—2-5 feet, spreading, cylindrical, glabrous, striate, often much branched.

BRANCHES.—Diffuse, striated longitudinally. Length of the branches, often 4-5 feet. Procumbent branches, on reaching the soil, often strike root.

LEAVES.—Alternate, exstipulate, entire, sessile; $1\frac{1}{2}$ - $3\frac{1}{2}$ inches long, 1 inch broad, oval or ovate-oval; "much tapering towards the base, but there dilated to form rounded, amplexicaul, stipule-like auricles, acute at apex, undulate, glabrous, thin, somewhat glaucous, and finely scurfy beneath"—(Trimen).^{*} Clarke says the leaves are puberulose† or glabrous, acute, $3 \times 1\frac{1}{2}$ inch.

PETIOLE.— $\frac{3}{4}$ inch; base dilated, amplexicaul (Clarke).

VERNATION.—Involute.

INFLORESCENCE.—Spikes 4-12 inches long; often branched.

FLOWERS.—Scentless, white, regular, bisexual; "on very short peduncles, in erect spicate terminal racemes; rachis and bracts glandular" (Trimen). Bracts and Bracteoles, persistent, leafy, shorter than the calyx.

BRACTS.—Though shorter than the calyx when the flowers mature and expand, they usually sheath the flower-buds completely in the

^{*} Trimen's Hand-book of the Flora of Ceylon, Vol. III, p. 65, 1895.

[†] C. B. Clarke's article in Hooker's "Flora of British India," Vol. III, p. 481.



Isaac Benjamin del.

Minuart Bros. Calcutta lith. London.

THE POISONOUS PLANTS OF BOMBAY.

Plumbago zeylanica Nat. Ord. Plumbaginaceae.

Natural size.



early stage of floral development. They are about $\frac{1}{2}$ inch long, ovate and acute. They are "studded with glands" as Trimen observes. The nature of these glands will be dwelt on further.

BRACTEOLES.—Subulate ; 1 or 2 ; smaller than the bracts and distinctly glandular.

CALYX.—Inferior, free, $\frac{1}{3}$ – $\frac{1}{2}$ inch by $\frac{1}{10}$ inch, persistent, narrowly tubular, or spindle-shaped ; "5-10 ribbed, often hyaline between the ribs ; mouth frequently funnel-shaped, scarious" (Clarke). Segments, five, with membranous margins ; "covered with large, stalked, spreading, globose, crimson glands" (Trimen). "Teeth very short" (Clarke).

COROLLA.—Inferior, persistent, tubular. Tube "fully 1 inch long and slender," says Trimen ; " $\frac{3}{4}$ inch," says Clarke. I may add that this is a matter of purely local development, and does not count for much. Petal-lobes, 5, spreading, nearly $\frac{1}{2}$ inch long, or more frequently less, oval, ovate, or ovoid ; acute.

ÆSTIVATION.—*Twisted* in the case of petals ; *plicate* in the case of the calyx.

It may be noted here that the corolla is less persistent than the calyx. This is characteristic of the genus *Plumbago*.

STAMENS.—5, hypogynous, distinct, opposite the petals.

FILAMENTS.—Free ; as long as the corolla-tube ; linear, dilated at the base.

ANTHERS.—Oblong ; exserted just beyond "*the throat*."

HYPOGYNOUS DISC.—Absent (Clarke).

PISTIL.—

OVARY.—Superior, 1-celled, 5-angular, narrowed at the apex.

STYLE.—Slender, simple, filiform ; divided into five stigmatose branches nearly throughout the length. "Base of style, glabrous" (Clarke).

STIGMAS.—5, capillary and quite distinct.

OVULE.—Solitary ; pendulous from a basal ascending funicle.

FRUIT.—A membranous capsule ; oblong, sharply-pointed, "included" in a persistent calyx and corolla. "Pericarp, thin below, thick and hard above" (Trimen).

DEHISCENCE.—Circumsciss near the base.

SEED.—Cylindrical or oblong-rotund, with undefined longitudinal striae ; green when immature ; brownish when mature.

ALBUMEN.—Farinaceous.

EMBRYO.—“In axis of the endosperm” (Trimen).

RADICLE.—Superior.

COTYLEDONS.—Flat.

PLUMULE.—Slightly rough.

This description is mainly based on Trimen's and Clarke's in works cited in the foregoing foot-notes, coupled with my own observations of the plant as grown in my Thana garden from year to year for over fifteen years.

REMARKS.

Much of what I should have liked to note under this head has already appeared in the previous pages of this Journal (*vide* pp. 349—357, Vol. IX, No. 4) in my description of *Plumbago rosea*—a congener of the plant I am now describing. My work, therefore, under this head is much curtailed.

The plant has the following synonyms:—

1. *Plumbago auriculata*.—Blume, Bijl. 736.
2. *Pl. flaccida*.—Moench, Meth. 429. (*Kew Index*—2nd column, p. 569, Vol. III, 1894.)
3. *Pl. viscosa*.—Blanco, Fl. Filip. Ed. I, p. 78. (*Kew Index*,—Volume and page cited as above.)
4. *Pl. sarmentosa*.—Lam. Illustr. I, 470, *Scandens*. (*Kew Index*.—Volume and page cited as above.)
5. *Thela alba*, Lour. Fl. Cochinch 119.—Rheede Hort. Mal., X, t. 8. (*Hooker's "Flora, Br. Ind.,"* Vol. III, p. 480.)

As noted above, Lamarek gives the plant the name *Plumbago sarmentosa*, which is a *scandent* variety of the plant. Under suitable circumstances, such as a rich soil or proper manuring of leaf-mould, I have known the plant to deviate from its suffruticose habit, and assume the scandent form.

The leaves, according to Roxburgh*, are “ovate, suddenly narrowed into the petiole; rachis of the spike pubescent, or glandular.”

The bracts are “threefold,” says Roxburgh, and “one-flowered; the outer bract is ten times larger than the lateral one; they are covered with the same gluten as the peduncle of the raceme; sometimes there is a fourth linear bract pressing the calyx.”

With regard to the special characters of the glandular bodies found on the various parts of the plant under description, I must refer the

* “Flora Indica,” Vol. I, p. 462.

reader, as I did in a paper published in a former volume of this Journal,* to the elaborate researches of Dr. John Wilson of the University of St. Andrews, contributed to the pages of the "Annals of Botany,"† in an able paper entitled "*The Mucilage—and other glands of the Plumbagineæ.*"

Dr. Wilson describes two sets of glands, viz.:—(1) The *Mettenian glands*, which in certain species of the *Plumbagineæ*, or under certain conditions, secrete chalk-scales, (2) *Mucilage-glands*, which secrete a viscid mucilage. These glands are of two kinds:—(a) *Stalked external glands*; (b) minute internal glands which are *sessile*. These latter are found on the calyx of *Plumbago*.

(1) With regard to the *Mettenian glands*, Dr. Wilson observes thus:—"In general, the glands occur in the longitudinal depressions on the stems of plumbagos, giving rise to a striated appearance, where calcium carbonate is secreted." They are present "on the leaves and bracts of all, and on the sepals of many of the species" of *Plumbago* and of other genera of the natural order *Plumbagineæ*. They are known to occur on the cotyledons of *Plumbago*, "even before the light is reached by the germinating seedlings," says Dr. Wilson. In his observations on the seedlings of *Plumbago zeylanica*, this careful observer notes thus:—"Examples of different ages were closely examined, revealing the fact that no mucilage-glands exist at the base of the cotyledons. Mettenian glands are as usual present on the cotyledons, and they likewise occur sparingly on the hypocotyledonary axis. A seedling which had the plumule destroyed at an early stage continued to vegetate by its cotyledons alone, which persisted for many months. They were ultimately $1\frac{1}{2}$ in. long and $\frac{1}{8}$ in. broad, and presented the very noteworthy phenomenon of bearing, like the leaves, chalk-scales on their undersurface."

In my remarks on *Plumbago rosea* in a former number of this Journal (*loc. cit.*), I candidly confessed that for a long time I did not know whence came the chalk-scales or the white crust on the leaves of *Plumbago rosea*; I now say that the same was my difficulty in the case of the white crust on the organs of *Plumbago zeylanica*. It would be quite appropriate to observe here that even such a consummate botanist as Professor Vines of Cambridge has fallen into error in tracing

* Vol. IX, pp. 345—365. *Plumbago rosea*, Linn.

† Vol. IV, pp. 231—255; 1889-1891.

the source of this calcareous deposit on the leaves of the *Plumbagos*. He traces the origin of the white crust to the epidermal cells. But Dr. Wilson points out the error of Professor Vines in words which are well worth reproducing here. They are as follows :—"It may be remarked here that Vines * is misleading in the following statements :— 'Similar scales (calcium carbonate) occur also on the leaves and herbaceous stems of various plumbaginaceous plants. . . . In these cases no glands like that described (water-gland) are present ; it is, therefore, to be concluded that the epidermal cells themselves excrete the calcium carbonate.' "

(2) With regard to the *Mucilage-glands* noticed by Dr. John Wilson in the *Plumbagos*, I have this to observe :—Dr. Wilson says that in *P. zeylanica* the mucilage-glands are of the same size as those in *P. rosea* and *P. capensis*, the largest being 38 mm. in diameter. In the specimens of *P. zeylanica* examined by Dr. Wilson, he says :—"A large number were seen clustered in the axil of a young leaf." Dr. Wilson gives a graphic figure in his paper, illustrating the relative sizes of the basal and secretory cells of one of these glands, which he modestly calls "a somewhat small example," but which I think is sufficient, for all practical purposes, in understanding the primitive structure of the mucilage-glands of the entire order *Plumbagineæ* hitherto unknown in the literature of British Botany. To come to the description of the first sub-division of the *Mucilage-glands*, viz. :—(a) the stalked external glands ; they are seen outside the calyx and on the rachis in *Plumbago zeylanica*. Dr. Wilson says that in *P. zeylanica* the entire rachis is thickly studded with active glands, like the calycine ones, but more minute. The second sub-division of the *Mucilage-glands* includes (b) the internal sessile glands. They occur on the inner face of the sepals and are to be seen in *P. zeylanica*. "Their basal cells are usually four in number," says Dr. Wilson, "but very often two (*P. rosea*). " He adds that the basal cells "in all cases support numerous very thin-walled secreting cells." The sessile glands, be it noted on the authority of Dr. Wilson, "do not offer any point of material distinction from normal mucilage-glands of the leaves." Such is a brief résumé of the observations of Dr. Wilson regarding the glandular appendages of the plant I am describing. I have tried to reproduce here every observation of Dr. Wilson on this very interesting question

of the glandular appendages of *P. zeylanica* for the benefit of my readers. Superficial readers will find it irksome, but to the practical student of Botany, Dr. John Wilson's researches are of rare value; this consideration is my only apology for thus occupying the pages of this Journal.

With regard to the presence of pith in *Plumbago zeylanica*, I may notice this fact that the new branches which shoot from the root direct, as apart from the main-stem, on cross-section show a good deal of pith in the central part. This morphological condition does not exist in the regular branches of the main-stem. The longitudinal striation of the green-glaucous bark is also well-marked in the branches shooting forth from the base of the stem.

The flowering time given by Trimen in Ceylon is between December and March. In September last the plant flowered in my garden in Thana, and now in the middle of October there is no flower; the fruit is maturing. The last time I saw my garden plant flower was in February of the current year. It may therefore be safely concluded that the plant flowers twice a year on this side of India in gardens.

As a "Stove-evergreen" in England, the plant flowers in June. (Johnson)*; Paxton † says the same. He gives the height of the plant as $1\frac{1}{2}$ ft.; but I have in my garden, under the Indian sky, branches from the main-stem measuring quite a yard in length, and exhibiting a scandent habit. The plant appears to have been introduced into England so far back as 1731. This is a point of historical interest.

Kurz is brief in his description of the *Plumbagineæ* in his Forest Flora of Burma (1877, two volumes), regarding the plant I am describing. He disposes of the plant by simply saying it is a "vesicatory" (p. 96, vol. II).

Dalzell and Gibson ‡ observe that the divisions of the "limb" of the corolla are "cuneate and retuse." They remark also that the plant is "common on the rocky places in Concans." I do not know if it is meant hereby that the plant grows wild in the Concans. I should like to know whether this plant is wild on this side of India, or whether it is an introduced plant, as the name indicates, from Ceylon, subsequently cultivated in gardens and thus

* Johnson's Gardener's Dictionary, Ed. 1894, p. 772.

† Paxton's Botanical Dictionary, Ed. 1868, p. 449.

‡ Bombay Flora, p. 220, Ed. 1861.

almost naturalized. I say "almost naturalized," as it appears to take kindly to any garden-soil in and around Bombay. Dalzell and Gibson conclude their notice of this plant with the somewhat puzzling remark that the plant "grows from Cabool to New Holland." Is it meant here to say that the plant grows *wild* from the capital of Afghanistan right down to the Austral regions we now know as Australia? Or is it meant to say that the plant is cultivated in gardens throughout the tract between Cabool and Australia? Would some better-informed Oriental Botanist come forward to elucidate this point?

Although, as I have said above, Kurz disposes of the description of *P. zeylanica* in a few words in his "Forest Flora of Burma" (1877), it evidently not being a forest plant of any pretension whatsoever; in a communication to the "Journal of the Asiatic Society of Bengal," which he published the same year, either simultaneous with, or subsequent to, the publication of his "Forest Flora of Burma," he makes the following remark as regards the *habitat* of the plant:—"In rubbishy places in and around villages, along river-banks and *toungyas*,* not unfrequent all over Burma, but apparently nowhere really wild."† Such is my own experience on this side of India, namely, that the plant is not wild here, but a cultivated one, which has taken kindly to the garden areas of our province.

Perhaps it would be useful to transcribe here the main features of *Plumbago zeylanica* from the original Latin, expressed in his *Hortus Malabaricus* (Vol. X, page 15, t. 8.) "Height of the plant, 2-3 ft., growing in sandy soil; root, yellowish black, with hairy roots." This hairy condition of the root I have been able to recognize in many garden specimens of fresh root; but I believe this is due mainly to poor soil-nourishment, for, as observed before, in most of the specimens I have examined from Thana and Bombay gardens, *Plumbago zeylanica* (Linn.) furnishes a root which is distinctly "long, succulent, often much contorted, and substantial" (K. R. K.). I hold myself solely responsible for this statement, and I would request every Bombay Botanist, who has specially studied the plant as I have

* *Toungya* = *Toung-ya*, which in Burmese means a form of hill-cultivation carried on by burning the jungles (Balfour). See my note, p. 352, Vol. IX, Bombay Natural History Journal, 1895.

† S. Kurz—Contributions towards the Knowledge of the Burmese Flora, page 217, Part II (Natural History, &c.), Vol XLVI, Calcutta, 1877 (Nos. I—VI).

had to do, to be able to write this paper after close study, either to contradict or verify my assertion. I am quite prepared to accept any view. Rheede says that the colour of the flowers is "completely white" (Latin—*coloris in totum candidi*). Rheede wrote his description over two hundred years ago, under a different sky—more southerly in direction. I mention this particularly by way of an apology as my plate, painted by the skilful hand of Mr. Isaac Benjamin from nature under my direct supervision, has a faint dash of the azure tint, not far removed from the light blue of *Plumbago capensis*. The natural size of the illustration (Plate R. accompanying this letter-press) will be amply sufficient to show that even if *Plumbago zeylanica*, at times under climatic influences, assumes a slightly bluish tinge, it can never approach the pretty bluish tinge—more strongly marked in *Plumbago capensis*. The latter is altogether a larger-flowered plant, most easily differentiated from *Plumbago zeylanica*.

The root of the plant requires some special remarks, as that is the part which is mostly used for criminal purposes. A full description of the dry and fresh roots is given in the "Pharmacographia Indica,"* which it would be quite appropriate to quote here. It runs as follows: "The roots of *Plumbago zeylanica* are from $\frac{1}{4}$ to 2 or more inches in diameter, seldom branched. When dry, the external surface is of a dark reddish-brown colour, somewhat shrivelled, and marked here and there by small warty projections; internally it is brown and striated; the fracture is short, the taste acrid and biting." Let me observe in passing that Rheede says (*opus cit.*) that it is less acrid than the root of *Plumbago rosea* (Tambido-Citroko, *i.e.*, the red Chitrak),—(K.R.K.). To continue the remarks of Dymock and his collaborateurs (*opus cit.*) as regards *Plumbago zeylanica*, they observe thus: "Wood hard, reddish, close-grained. A section of the fresh bark, when magnified, shows numerous bundles of bright yellow stone-cells forming an irregular zone towards the inner part of the middle layer of the bark. The cells of the parenchyma are large and contain much starch. In the dried root the yellow *Flumbagin* is seen in the cell-walls of both the parenchyma and the woody tissue, but not in a crystalline form (*Flückiger and Gerock*)."

* Vol. II, p. 331 (Dymock, Warden and Hooper). "Pharmacographia Indica," 1891. Bombay Education Society's Press.

POISONOUS PROPERTIES.

What I have said of the poisonous properties of *Plumbago rosea*, applies equally to the plant I am describing. Dymock and his colleagues, however, say in their "Pharmacographia Indica,"* that "*Plumbago zeylanica* is mentioned by several European writers upon Indian drugs, but has not attracted the same amount of attention as *Plumbago rosea*, which is said to be more active." (The Italics are mine.—K.R.K.) Dr. Dymock says that *Plumbago* root given internally in large doses acts as a *narcotico-irritant* poison.

O'Shaughnessy † attributes to the root vesicant properties, not unlike cantharides when used *externally*, i.e., over the skin. To quote his very words, the properties of *Plumbago rosea*, "and of the *Plumbago scandens* and *Plumbago zeylanica* are nearly identical. It is applied by the natives of India to buboes in the incipient stage. In fact, says he, the prevailing characters of the entire Indian *Plumbagineæ* are "astringency and acidity."

Udoy Chand Dutt ‡ says distinctly that the root of the *Plumbago rosea* is a more powerful vesicant than that of *Plumbago zeylanica*. That may be ; but I do not suppose there is any difference between the two as regards their abortifacient property. They contain the same active principle, *Plumbagin*, which I have already dwelt on in my paper on *Plumbago rosea*. Dr. Dymock observes§ that "at present the physical properties of the principle, the so-called *plumbagin*, are not sufficiently well-known to enable one to positively assert whether it is odourless or not, while its chemical constitution has not been studied." It is, however, a matter of certainty that the active principle is detectable in the contents of the stomach by the action of subacetate of lead. We have the authority of O'Shaughnessy on this point. This is what he says :—"The root, in various forms, is much employed as a poison in India ; and, as an irritant to occasion abortion, it is introduced into the vagina and applied directly to the neck of the uterus. In a criminal case of the former kind in 1837, the Editor ¶ succeeded in detecting the poison by acting on the contents of the stomach with alcohol, concen-

* Vol. II, p. 330, (*op. cit.*) 1891, Bombay.

† "Bengal Dispensatory," pp. 508 and 509, Ed. 1841, Calcutta.

‡ "The Materia Medica of the Hindoos," Calcutta, 1877, p. 187.

§ "Pharmacographia Indica," p. 334, Vol. II, 1891.

¶ i.e., Dr. O'Shaughnessy himself.—K.R.K.

trating the tincture, redissolving in a small quantity of boiling water, and adding the subacetate of lead, by which the very characteristic red colour was immediately occasioned. By a modification of this process two grains of the powdered bark may be detected in a pint of a mixture of milk, blood and various articles of food.* Dr. Lyon classes *Plumbago zeylanica* among irritants and observes that "powerful irritants may like purgatives cause abortion, owing to the uterus participating in the irritant action set up in the system."† Mr. Gribble, late of Madras, and now of Hyderabad, Dēkkan, in describing the poisons most generally used for criminal purposes in the Madras Presidency, refers to *Plumbago zeylanica* thus :—"The use of this poison is by no means uncommon; five cases occurred in 1882 and three in 1883."‡ Mr. Gribble classes the plant among irritant vegetable poisons which may be identified by chemical or by physiological tests (p. 225, *op. cit.*). Dragendorff notes that *Plumbagin* is coloured cherry-red by small quantities of alkalies. He includes it among the bitter principles soluble in ether ("Plant Analysis," pp. 146—149, ed. 1884). The table given in the "Pharmacographia Indica" (pp. 335—339, vol. II.), showing the particulars of plumbago-poisoning in India, is well worth the perusal of those wishing to have more information on the subject. The following observation of Dr. Norman Chevers § may be usefully quoted here : "Dr. Shortt || remarks upon the use of *Plumbago zeylanica* or *Chittra moolum*, that 'it is a universal remedy in dysmenorrhœa, and equally so as a means of producing abortion; there is perhaps scarcely a village in India where the use of this drug as such is not known. Its action is that of a powerful irritant; it is not only had recourse to as an internal remedy, but is more frequently applied externally.' " I gather from Dr. Norman Chevers' quoted cases (pp. 739—741, *op. cit.*), that, though plumbago may cause abortion, it does not necessarily cause the death of the mother; "some women escape with life after having aborted."

* "Bengal Dispensatory," p. 510. Calcutta edition, 1841.

† Medical Jurisprudence for India, p. 379, 1st ed., 1889. (See also P. 106, Vol. VIII, of this Society's Journal, for Professor Schmidberg's remarks in this connection, quoted by me—K.R.K.)

‡ Outlines of Medical Jurisprudence for Indian Criminal Courts, Madras, 1885, p. 201.

§ A Manual of Medical Jurisprudence for India, 1870, p. 739.

|| *Fœticide*, (Madras Quart. Jour. of Medical Science, July 1861, p. 237), quoted from N. Chevers.

NOTES ON NESTS TAKEN FROM MARCH TO JUNE
AT KOHAT AND MUSSOOREE, NORTH-
WESTERN PROVINCES.

BY CAPTAIN R. H. RATTRAY.

KOHAT.

THE RAVEN (*Corvus corax*).—I found a nest in a small tree overhanging a stream, about 20 feet up, in a large fork. It was built, as usual, of sticks and twigs and lined with a large piece of goat's skin, with the hair attached. Eggs four, slightly incubated. This bird breeds commonly here, but owing to the paucity of trees it is difficult to find many of them.

THE BLACK-RUMPED MAGPIE (*Pica bottanensis*).—This bird breeds plentifully across the border. I sent men out, who brought me in a lot of fully-fledged young ones in May. They found eggs, but not quite understanding my meaning left them until hatched, and then came in with the young birds.

THE INDIAN PARADISE FLYCATCHER (*Terpsiphone paradisi*).—This bird breeds here fairly plentifully. On my return from leave, a few days ago, I saw them here, and on searching found some nests which contained half-fledged young ones. I got one nest on the 28th of June, with three addled eggs in it. This nest was suspended from three very fine twigs, about 15 feet from the ground. It was neatly made of fine grasses and fibres, with a thick coating of spider's web. The cup was a very deep one, being almost two inches in depth.

BONELLI'S EAGLE (*Hieraetus fasciatus*).—This bird is common and breeds here, but owing to the hills being across the frontier, it is almost impossible to get at the nests. One nest I had a man let down to as it was built on a ledge of a high cliff and almost inaccessible. It contained young ones about three weeks old on the 3rd April.

THE SHAHIN FALCON (*Falcon peregrinator*).—I failed to procure this bird's eggs, but it undoubtedly breeds in the hills near here. There were two nests within reach of the station—one at Nin Gaudi and the second at Hangu, 29 miles off. On 10th April, the one at Hangu was ready to lay in, but the birds deserted owing to my sending a man down to inspect the nest. It was, as usual, built of sticks and twigs on a ledge overhanging by a rock, the young were subsequently

brought in from another cliff near. The second nest was unapproachable.

MUSSOOREE.

HIMALAYAN TREE-PIE (*Dendrocitta himalayensis*).—Very common this year. I obtained five nests, containing fresh eggs, between 23rd May and 10th June, 1896.

YELLOW-CHEEKED TIT (*Machlolophus xanthogenys*).—One nest found on the 24th April, 1896, in a deep hole in an oak tree about 7,000 feet. The nest was composed of a thick pad of moss, with a lining of thickly-felted pad of hair of various animals. Eggs five in number. I also found another nest with young ones, which I left alone.

RUFIOUS-CHINNED LAUGHING THRUSH (*Ianthocincla rufigularis*).—I found one nest on the 28th May, 1896, about 6,000 feet, in an oak tree near the main trunk about eight feet from the ground. The nest was composed of fine twigs lined with the fibrous bark of some tree. One nest contained three eggs, pure white, with very fine fragile shell, shaped very like eggs of *Pomatorhinus erythrogenys*. Size, $1.14 \times .76$ — $1.13 \times .75$ — $1.15 \times .76$.

RED-HEADED LAUGHING THRUSH (*Trochaloxyterum erythrocephalum*).—I obtained a nest of this bird on the 14th May, 1896. This bird has not, I think, been previously noted as breeding so far west as Mussooree. The nest was in a deep well-wooded nullah about 5,800 feet. I found the nest on the 12th May, and it contained 2 eggs. I left these and again visited the nest and found still only 2 eggs, so I took the eggs and the nest, and shot the parent-bird. The nest was in a thick creeper overhanging a rock and about five feet from the ground. It was composed of dried twigs and the roots of some creeper and a good deal of moss on the outside. Next came a layer of dead oak leaves, then a lining of fine grasses and stalks of maiden-hair fern. The eggs were pale blue with a few spots and streaks of reddish-chestnut at the large end. Size, $1.15 \times .77$ and $1.17 \times .80$.

HODGSON'S GREY-HEADED FLYCATCHER WARBLER (*Cryptolopha xanthoschista*).—Common. Six nests found from the 16th April to 31st May. These contained three or four eggs in each nest. Two more were found with young ones in them and two ready to lay in, but a week later were found to have been destroyed. Eggs white.

GREY-HEADED OUZEL (*Merula castenea*).—One nest found on the 23rd May, 1896, on a bank at the foot of a high rock. It contained two eggs, very hard set. Nest found $6\frac{1}{2}$ inches in diameter and 4 inches in height; composed of thin twigs and a good deal of moss lined with fine grass stems. Eggs like *Merula bouboul*, the Grey-winged Ouzel, but lighter coloured. Size, one egg $1\cdot00 \times \cdot8$; the other egg got broken.

TICKELL'S OUZEL (*Merula unicolor*).—One nest found contained four eggs, on the 26th of May, at about 6,500 feet. The nest was placed near the trunk of a tree, about 10 feet from the ground, and was composed of roots and moss lined with fine roots and maiden-hair fern.

SPOTTED HIMALAYAN SCOPS OWL (*Scops spilocephalus*).—One nest found in a hole of a tree about 10 feet from the ground. No lining to the nest. Eggs four, white and very round, and hard-set. Size, $1\cdot23 \times 1\cdot03$ — $1\cdot21 \times 1\cdot04$ — $1\cdot29 \times 1\cdot04$ — $1\cdot20 \times 1\cdot02$. Another nest contained one fresh egg, four days later, near the same place. Size, $1\cdot24 \times 1\cdot05$.

COLLARED PIGMY OWL (*Glaucidium brodiei*).—One nest found on 22nd April. It contained five almost fresh eggs, and was in a hole in an oak tree about 20 feet from the ground. No lining to the nest. The hole had apparently been enlarged by the bird. About 6,500 feet elevation. Size of eggs, $1\cdot22 \times \cdot92$ — $1\cdot18 \times \cdot95$ — $1\cdot18 \times \cdot94$ — $1\cdot21 \times \cdot88$ — $1\cdot19 \times \cdot90$.

LARGE BARRED OWLET (*Glaucidium cuculoides*).—One nest found in a natural hole in an oak tree about 30 feet from the ground. It contained three fresh eggs. The bird was caught on the nest. Size of the eggs measured $1\cdot43 \times 1\cdot16$ — $1\cdot45 \times 1\cdot17$ — $1\cdot44 \times 1\cdot15$. Elevation, 6,500 feet.

NOTE ON *PERICROCOTUS SPECIOSUS* VEL *PATERCULUS*.

BY E. C. STUART BAKER, F.Z.S.

On p. 151, Vol. X, No. 1 of this Journal, I wrote some remarks on the above species of birds in reply to Mr. Oates, who had in the previous number disagreed with what I had written concerning them. At the time I wrote I had but few specimens of the genus *Pericrocotus* in my possession; now, however, that I am at home, I have been able to examine other birds obtained by me in North Cachar, and in order to strengthen what I have already asserted, I give further notes regarding dimensions, &c., which I have drawn up in tabular form. It will be seen from this table that I have examined altogether 27 birds, of which 19 are adult males, 1 a non-adult male, and 7 females. As regards the tail, these 27 birds vary in length between 3·65" and 4·3", both these extreme measurements being those of fully adult males. The wings of the males, with three exceptions—one of these being a young bird—only vary from 3·3" to 4·1", the females running considerably smaller. The coloration of the tails is not, as Oates remarks, of much importance; but it is interesting to note that, with the exception of the amount of black at the base of the lateral rectrices, the coloration of the tails of the females is extremely constant when compared with that of the males.

These 27 birds are now in the collection of the Hon. W. Rothschild at Tring.

No.	Tail.	Wing.	Central Rectrices.	Other Rectrices.
1 ♂	4·1"	3·9"	Partly edged red, and with red spot at tip.	All red except at extreme base.
2 ♂	3·7"	4"	Wholly black	Bases diagonally black for half their length
3 ♂	4·05"	3·91"	Do.	Do. on nearly half
4 ♂	3·81"	3·9"	Edged narrowly with red.	Do. do.
5 ♂	4·05"	3·9"	Wholly black	Do. do.
6 ♂	4·3"	3·92"	Broadly edged with red ...	Do. on a quarter only.
7 ♂	3·65"	3·92"	Wholly black	Do. but with even less.
8 ♂	4·05"	3·92"	With faint red tips only.	Do. for $\frac{3}{4}$ their length and with next pair also broadly black.

No.	Tail.	Wing.	Central Rectrices.	Other Rectrices.
9 ♂	3·9"	3·9"	Wholly black	Bases diagonally black for $\frac{1}{4}$ their length.
10 ♂	3·85"	3·9"	With faint red tip	Do. for $\frac{1}{2}$ their length.
11 ♂	3·95"	3·95"	Wholly black	Do. for $\frac{1}{3}$ their length.
12 ♂	4·25"	3·91"	Slightly edged red near tip.	Do. do.
13 ♂	3·87"	3·83"	Wholly black	Do. do.
14 ♂	3·8"	3·71"	Do.	Do. do.
15 ♂	4·12"	3·98"	Narrow red edge	Do. do.
16 ♂	3·98"	3·93"	Wholly black	Do. do.
17 ♂	4·05"	3·87"	Do.	Do. do.
18 ♂	4·1"	3·87"	A speck or two of red on the edge.	Do. do.
19 ♂	4·1"	3·9"	Broadly edged red	Do. do.
1 ♀	3·98"	3·72"	All black	Tipped and edged yellow, next pair black for $\frac{3}{4}$ their length.
2 ♀	4·27"	3·75"	Do.	Do. do. with others basally black.
3 ♀	4·25"	3·78"	Do.	Do. do. do.
4 ♀	4·22"	3·68"	Do.	Do. do. do.
5 ♀	4·"	3·72"	Do.	Do. do. do.
6 ♀	3·80"	3·75"	Do.	Do. do. do.
7 ♀	4·"	3·75"	Do.	Do. do. do.
1 juv ♂	4·25"	3·82"	Front indications of yellow on edge.	Broadly edged with yellow.

DESCRIPTIONS OF TWO NEW SPECIES OF BUTTERFLIES FROM UPPER BURMA.

BY LIONEL DE NICEVILLE, F.E.S., C.M.Z.S., &c.

1. CASTALIUS ROXANA, n. sp.

HABITAT: North Shan States; North Chin Hills.

EXPANSE: ♂, 1.0 inch.

DESCRIPTION: Differs from *C. roxus*, Godart, in having the white area on the upperside of the forewing somewhat larger; in the hindwing the white area is twice as extensive, permitting the appearance of the three pairs of black spots near the margin which in *C. roxus* are lost in the outer black area occupying nearly half the surface; on the hindwing on the underside there are two black spots only in the middle of the submarginal series, in *C. roxus* there are three; and the marginal series of white spots on both wings are far more prominent in *C. roxus* than in *C. roxana*.

2. PAPILIO (Byasa) POLLA, n. sp.

HABITAT: North Shan States; North Chin Hills.

EXPANSE: ♂, 5.0 inches.

DESCRIPTION: Differs from *P. latreillei*, Donovan, on the upperside of the hindwing in the discal white patch being larger (placed further from the outer margin), extending into the discoidal cell instead of ending (as a rule) considerably before the end, and occupying anteriorly an additional interspace, in *P. latreillei* the patch is bounded in front by the discoidal nervule, in *P. polla* it reaches the second subcostal nervule; by the outer margin and the end of the tail being broadly edged with carmine instead of having black cilia; on the underside of the hindwing in *P. latreillei* there is invariably a small white marginal spot in the subcostal interspace which is wanting in *P. polla*; sometimes in *P. latreillei* there are two small white spots, sometimes one only, usually none, in the discoidal interspace in continuation of the discal white patch, these in *P. polla* being developed into a very large quadrate white spot, which is, in fact, much the largest spot of the four forming the patch; the broad carmine margin is also very distinctive of *P. polla*, being wholly absent in the allied species.

N.B.—The two butterflies briefly diagnosed above will be more fully described and figured hereafter.

NOTES ON A COLLECTION OF BUTTERFLIES FROM
THE NORTH CHIN HILLS AND UPPER
CHINDWIN DISTRICT, BURMA.

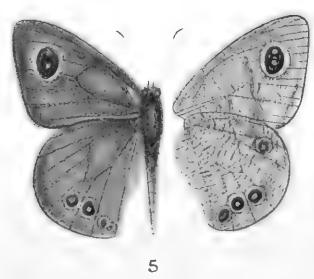
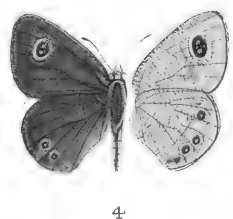
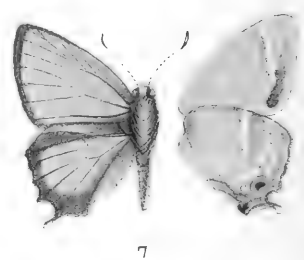
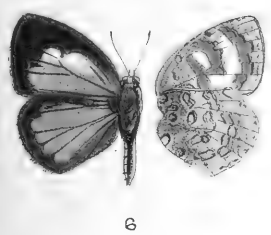
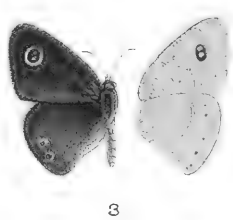
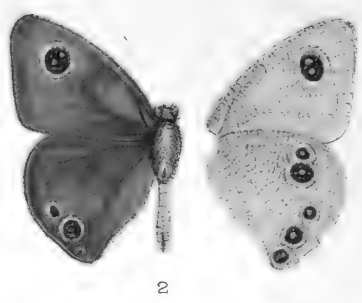
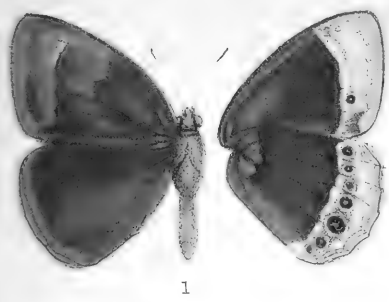
BY CAPT. E. Y. WATSON, INDIAN STAFF CORPS, F.Z.S., F.E.S.

(*With a Plate.*)

The butterflies recorded in the present list were, with the exceptions noted below, taken by me in the North Chin Hills and Upper Chindwin District between January and June, 1893, *i.e.*, in the dry-season. The bulk of the species were obtained within a few miles of Kalewa on the Chindwin river, which locality is referred to below as the "Upper Chindwin," as there is no doubt that the species occurring at Kalewa also occur throughout the greater part of the Upper Chindwin District; the remainder of the species were obtained in the hills on the road from Kalemio to Tiddim, posts situated about 50 miles apart, and on opposite sides of the most easterly range of the Chin Hills.

At Kalewa, which is situated in the angle of the confluence of the Myittha and Chindwin rivers, the forest is of that description called in Burma "Eng," and consists of deciduous trees of rather small size growing in quartzzy soil with little or no undergrowth; on the banks of the rivers this is replaced by large trees in dense undergrowth. Kalemio is situated close to the Myittha river, the country immediately round which is either cultivated with rice or covered with elephant-grass; the road to Tiddim after crossing the paddy-land leads through about seven miles of thin jungle, chiefly "Eng," before reaching the foot of the hills; from here the jungle becomes denser and the road runs steeply up the eastern slopes of the hills to Fort White at an elevation of about 7,000 feet, No. 3 stockade having been passed through *en route* at some 3,500 feet.

Up to between 4,000 and 5,000 feet the jungle consists of large forest trees with dense undergrowth; above that height the prevailing trees are rhododendrons and magnolias, to which at above 6,000 feet are added various varieties of oaks; at the latter elevation also patches of grass-lands begin to appear, the ridges and highest slopes of the hills being almost entirely free from jungle, which is confined to small oak and rhododendron copses.



West Newman chromo.

BURMESE BUTTERFLIES.



After reaching Fort White, the road ascends slightly to the top of the ridge and then runs northward to the highest point of the range named Kennedy Peak, somewhere about 8,500 feet in height, the road passing chiefly over grassy downs and through two or three copses ; from Kennedy Peak the road descends rapidly through dense woods to the post of Dimlo ; here the forest is much thinner, the trees being for the most part small and the undergrowth replaced by grass which grows to a considerable height in the rains ; this description of forest continues until within a few miles of Tiddim, where it is replaced by fir-woods by which that post is surrounded ; the road from Dimlo to Tiddim is almost level, running along a ridge about 5,500 feet in height. Immediately to the west of this ridge and between 3,000 and 4,000 feet below it lies the Manipur or Nankathé river, which, after running some forty miles in a northerly direction, turns sharply to the east and falls into the Myittha river about twenty miles above Kalembo.

The rainy-season lasts from about the beginning of June to the end of November, but I have no information about the exact rainfall in the hills : it however appears to be well over 100 inches ; in the Upper Chindwin District the average is about 80 inches.

At Kalewa the best month for butterflies is March, but on the ridge there is not much to be done before May, the nights being extremely cold, very commonly going below freezing point ; while on one occasion, in honour of the arrival of certain high military authorities who were paying a visit to the hills on a tour of inspection, there was a snow-storm on Kennedy Peak ; this, however, I believe, is very exceptional and must be put down to the auspicious occasion.

The country explored comprises only a very small portion of the North Chin Hills, and, owing to the hostility of the Chins, there were no opportunities of collecting except on the line of march and in the immediate neighbourhood of the posts, so there is no doubt that many species remain to be discovered, especially in the valleys in the interior.

In addition to the specimens obtained by myself, Lieutenant Firth, of the 1st Burma Regiment, and Surgeon-Captain Graves, who were stationed at No. 3 Stockade in the rains, made a collection of some 100 species, all of which were kindly handed over to me ; this collection

contained twenty-seven species which I had not met with, two of which, viz., *Melanocyma faunuloides* and *Papilio polla*, have recently been described as new by Mr. de Nicéville; the former of these is of special interest, the only other described species of the genus being, as far as known, confined to the Malay Peninsula; and a third species obtained, *Phengaris atroguttata*, has hitherto only been recorded within Indian limits from the Naga Hills. Of the others, *Lethe latiaris*, *Tajuria illurgis*, and *Armandia lidderdalii* are rare and worthy of special note.

I also obtained from Captain Longe, R.E., specimens of *Charaxes arja*, *Charaxes hipponax*, *Papilio rhetenor*, and *Papilio ganesa*, none of which I had myself met with, and which were taken near the Manipur river, a few miles from Tiddim at an elevation of about 2,000 feet.

From this officer also I obtained some forty-seven species which were taken by a collector of his in the Manipur State between Manipur and Tammu; these species are included below under the heading "Manipur," which locality must not be confused with the "Manipur River" which at the point referred to above is some distance south of the Manipur State. This collection is of special interest as it was made in the southern and eastern portions of the State, while the only other published list from the neighbourhood is one* by Mr. Butler, entitled "On a Collection of Lepidoptera made at Manipur and on the Borders of Assam by Dr. George Watt," the species recorded in which appear to have been taken chiefly or entirely in the northern portion of the State bordering on Assam. Of the species taken by Captain Longe's collector, *Ypthima iarba*, *Lethe sidonis*, and *Colias edusina* are specially noteworthy.

Of the 320 species here recorded, the following are new to science:—*Mycalesis adamsonii*, *Ypthima cerealis*, *Ypthima lycoides*, *Lampides* sp., *Zephyrus lethæa*, *Caprona elwesii*, and *Taractrocera atropunctata*; the types of the above, except of the species of *Lampides*, which has not yet been described, are in the collection of Mr. de Nicéville.

The following species have not been previously recorded from within Burmese limits, or have only been so recorded with considerable doubt:—*Mycalesis suaveolens*, *Ypthima methora*, *Ypthima asterope*,

* Annals and Magazine of Natural History, fifth series, vol. xvi, p. 298 (1885).

Zipætes scyllæ, *Neptis cartica*, *Symbrenthia niphanda*, *Cyaniris dilectus*, *Phengaris atroguttata*, *Orthomiella pontis*, *Nacaduba bhutea*, *Castalius ananda*, *Arrhopala ganesa*, *Acesina paraganesa*, *Ilerda androcles*, *Aphnæus schistacea*, *Deudorix epijarbas*, *Rapala buxaria*, *Armandia lidderdalii*, *Papilio paphus*, *Ismene ataphus*, *Celaenorrhinus pero*, *Daimio narada*, *Tagiades obscurus*, *Pamphila gemmata*, *Augiades brahma*, and *Halpe cerata*.

Family NYMPHALIDÆ.

Subfamily EUPLEINÆ.

1. DANAIS (Tirumala) LIMNIACE, Cramer.

Common everywhere up to 3,500 feet ; also from Manipur.

2. DANAIS (Tirumala) SEPTENTRIONIS, Butler.

Similarly distributed and almost equally common.

3. DANAIS (Limnas) CHRYSIPPUS, Linnæus.

Not noticed above 3,500 feet ; also from Manipur.

4. DANAIS (Salatura) PLEXIPPUS, Linnæus.

Common everywhere up to 7,000 feet ; also from Manipur.

5. DANAIS (Parantica) MELANOIDES, Moore.

Common in the Upper Chindwin and up to 3,500 feet in the Hills.

6. DANAIS (Caduga) MELANEUS, Cramer.

A single female from the Upper Chindwin in April, and a male at 3,500 feet in May.

7. DANAIS (Caduga) TYTIA, Gray.

A single female at 5,000 feet in May.

8. EUPLEA (Crastia) GODARTII, Lucas.

Extremely common in the Upper Chindwin ; also from Manipur. This must be almost the north-western limit to which this species ranges.

(Var.) LAYARDII, Druce.

Two males from the Upper Chindwin in May and June. I have absolutely no doubt that this so-called species is nothing more than a casual variety of *C. godartii*, and that wherever that species occurs commonly, specimens of the form *layardii* will occasionally be met with. The latter is recorded in Moore's "Lepidoptera Indica" from Siam, Upper Tenasserim and Arakan ; I have also taken it at Toungoo, Lower Burma, and in the Yaw District, Upper Burma. Distant records it under the name *E. binghami* from the Malay Peninsula, Java, and

Sumatra. Moore does not mention its occurrence in either of the above-named islands, though he records an allied species, *C. inconspicua*, Moore, from Sumatra. The violet-grey apical patch of *C. godartii* is excessively variable, and in some specimens is barely traceable; when it is altogether absent, the specimen becomes *C. layardii*.

9. *EUPLEA* (Penoa) *DEIONE*, Westwood.

Excessively common in the Upper Chindwin in April and May, but not noticed in the hills; also from Manipur. This species has a sexual patch of modified scales on the upperside of the hindwing in the male precisely similar to, but less developed than, the corresponding patch found in *T. linnæi*; in *P. limborgii*, the southern race of *P. deione*, this patch is more inconspicuous.

10. *EUPLEA* (Trepisichrois) *LINNÆI*, Moore.

Common in the Upper Chindwin and throughout the hills; also from Manipur. This appears to be the only *Euplea* that is found above 5,000 feet.

11. *EUPLEA* (Danisepa) *DIOCLETIANUS*, Fabricius.

A single male from the Upper Chindwin in May. In his "Lepidoptera Indica" Moore has sunk *D. diocletianus* as a synonym of *D. rhadamanthus*, though the former name has priority, and has given the name *D. ramsayi* to the race from the Eastern Himalayas; however, after examining the long series of this subgenus in the British Museum, I do not think this name should stand even as that of a local race, as though Eastern Himalayan specimens show, as a rule, more white on both wings than those from further south, yet some southern specimens exhibit quite as much white as other northern ones, and a perfectly complete gradation can be traced from one extreme to the other.

12. *EUPLEA* (Pademna) *KLUGII*, Moore.

Nineteen males and eleven females from the Upper Chindwin in April and May. This species appeared in the utmost profusion at the end of April: the specimens caught include typical *klugii*, *grantii*, *dharma*, *augusta* and *imperialis*, among them being a male of *imperialis* taken in coitû with a female of *klugii*, the latter agreeing exactly with the figure (of female *klugii*) in Moore's "Lepidoptera Indica" which, in wanting the marginal spots on the forewing,

is rather a striking variety ; it is not, however, quite clear why this particular form should be taken as the female of typical *klugii*, as there is a common form of the female marked precisely as in typical male *klugii*. I further obtained two males and two females which cannot be assigned to any of the above forms :—one of the females is nearest to the form *maclellandii*, with which it agrees in the obsolescence of the blue gloss and also in the markings, except that the cell-spot is wanting (according to the description this spot is present in both sexes, but according to the figures is absent in the male and present in the female) ; the remaining three specimens belong to forms which have not been named and are all remarkable for the obsolescence of the spots on the upperside ; the female has five apical submarginal spots and three discal ones on the forewing, and three apical submarginal spots on the hindwing, all the marginal spots on both wings being wanting ; in both the males the upperside of the hindwing is absolutely without markings, while on the forewing in one specimen there are four very small subapical spots and two discal ones, and in the other only the four subapical ones ; these two males, from being almost without spots, have a very distinct appearance. The forms *regalis* and *illustris* were not met with though they occur a little further south. With reference to the former, it is worth noting that Colonel Swinhoe in a recent paper on the Butterflies of the Khasi Hills, while sinking *regalis*, Moore, as a synonym of *klugii* redescribes it again as "*Var. hamiltoni*," and evidently considers the latter as very nearly equal to a distinct species as he gives it a separate number in his list. No form of the local race *crassa* was met with, and only rare stragglers of this race would occur as far north as the Upper Chindwin.

13. EUPLEA (Isamia) ROGENHOFERII, Felder.

A single male of the typical form with both rows of spots obsolescent on the upperside of the hindwing was taken at the foot of the hills in May.

14. EUPLEA (Stictoploea) HARRISII, Felder.

A single very battered male of the form *binotata* was taken at Kalewa in May.

I wish here to call attention to some very misleading remarks made by Colonel Swinhoe in his paper on the Khasi Hill

Butterflies above referred to, which was published in the Transactions of the Entomological Society of London for 1893. Under the present species he makes the following remarks with reference to Mr. de Nicéville's recent paper on the variation of *S. harrisii*:—"I think if Mr. de Nicéville had written that out of three hundred *S. binotata* received by him from the Rev. W. A. Hamilton he got the seven or eight specimens exhibited when his paper was read at the Society's meeting representing the various extremely rare varietal forms described by Mr. Moore, it would have been fairer." As a matter of fact, as can be readily verified by a reference to the paper in question which was published in the Transactions of the Entomological Society of London for 1892, page 247, Mr. de Nicéville distinctly states that the "forty-five specimens" (not "seven or eight") then exhibited were picked "out of a collection of upwards of two hundred caught in the Khasi Hills" and sent to him by the Rev. W. A. Hamilton.

How in the face of this Colonel Swinhoe can have made the statement above quoted it is difficult to understand, especially as he was present at the time the specimens were handed round and personally made a few remarks about them. Of course the chief reason for exhibiting such a large series was that not only were typical specimens of all the seven named forms represented, but also every possible intergrade.

Subfamily SATYRINÆ.

15. MYCALESES (Virapa) ADAMSONII, n. sp. (Plate A, Fig. 1, ♀.)

HABITAT: Upper Burma.

EXPANSE: ♂, 2·00, ♀, 2·15 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* brown with a dark anteciliary line. *Forewing* crossed beyond the middle by an indistinct pale band, obsolete below the first median nervule; the outer portion of the wing paler, with two very faint submarginal brown lines. *Hindwing*, margin pale with a dark submarginal line. UNDERSIDE, *both wings* dark brown from the base to beyond the middle, clothed as far as the end of the discoidal cell with ochreous hair-like scales, with a dark anteciliary line. *Forewing* crossed beyond the middle by a broad lilac-white band, outwardly bordered by a sinuous brown line, beyond which the margin is broadly ochreous, and bears a very faint

submarginal fuscous line ; a black ocellus with white centre and yellow outer ring in the lower median interspace, and four subapical incomplete ocelli with white centres. *Hindwing* with a similar broad lilac-white postmedial band bearing seven perfectly formed ocelli, of which the fifth is large, the first, fourth and sixth subequal and much smaller than the fifth, the second, third and seventh being also subequal and the smallest of all ; a lilac-white submarginal line, beyond which is an ochreous marginal line. *Cilia* fuscous throughout. The FEMALE differs only in being paler above and below, the transverse band on the UPSIDE of the *forewing* being more distinct and almost white above the third median nervule.

Nearest to *M. anaxias*, Hewitson, from which it differs in the entirely different shape and direction of the pale band on the upperside of the forewing. The underside is also somewhat similar to that of *M. anaxias*, but is much paler, and the fascia on the forewing is entirely different.

Described from a male from Katha, Upper Burma, in the collection of Mr. de Nicéville, and a female taken in April a few miles out of Kalewa, in the Upper Chindwin District, Burma. I have much pleasure in naming this species after Lieutenant-Colonel C. H. E. Adamson, who has done so much work among the butterflies of Burma, and in whose jurisdiction the Upper Chindwin District lay at the time of the capture of the female described.

16. MYCALESIS (Gareris) SANATANA, Moore.

Two males of the rainy-season form at 3,500 feet in June, four males of the dry-season form at from 3,500 to 5,500 feet in May, and one female of the dry-season form from the Upper Chindwin in April. These specimens are not quite typical, and appear to constitute an ill-defined local race.

17. MYCALESIS (Sadarga) CHARAKA, Moore.

A single male of the dry-season form from Manipur.

18. MYCALESIS (Orsotriena) MEDUS, Fabricius.

The dry-season form was common in the Upper Chindwin from December to March.

19. MYCALESIS (Calysime) PERSEUS, Fabricius.

Probably common in the Upper Chindwin, but only a single male was caught (in April) belonging to an intermediate seasonal form.

20. MYCALESIS (Calysisme) PERSEOIDES, Moore.

The commonest *Calysisme* in the Upper Chindwin, the dry-season form during March and April, and the rainy-season form from April to June.

21. MYCALESIS (Calysisme) VISALA, Moore.

Two males of the rainy-season form from the Upper Chindwin in June.

22. MYCALESIS (Calysisme) INTERMEDIA, Moore.

Two males of the rainy-season form from 3,500 feet in September.

This and the two preceding species have only recently been discriminated by Moore in "*Lepidoptera Indica*." They appear to be quite distinct and are readily separable from the other species of the subgenus. With reference to the other species of the subgenus detailed by Moore, I have not seen *C. rama* or *C. nicobarica*, but *C. mineus*, *C. subdita*, and *C. andamana* all appear quite distinct from one another and from the four species recorded above, though I must confess I am unable to recognise any difference between *C. mineus* and *C. polydecta*, the descriptions and figures of both of which as given by Moore apply equally well to specimens from Southern India and from Burma, and as the sexual glands in the male do not differ either in colour or size, I do not see how the two species can be discriminated; in his descriptions Moore does not compare the two in any way.

23. MYCALESIS (Calysisme) MINEUS, Linnæus.

A single male was taken in the Upper Chindwin in February. This subgenus does not appear to extend into the hills above 3,500 feet.

24. MYCALESIS (Pachama) SUAVEOLENS, Wood-Mason and de Nicéville.

Two males and one female from 3,500 feet in May and June.

25. MYCALESIS (Samanta) MALSARA, Moore.

Ten specimens of the rainy-season form at 3,500 feet from May to September, and numerous ones of the dry-season form from the Upper Chindwin in March, and from 1,500 to 5,500 feet in March to May: also several from Manipur. I record these specimens as *S. malsara*, though many of them are quite inseparable from *S. lepcha*. The distinguishing point between the two races is the greater breadth of the discal band on the underside in *S. malsara*; this character is, however of no value in the Chin Hills, as in both seasonal forms some specimens

have the band as broad as in typical *S. malsara* from Lower Burma, while others have it as narrow as, and are otherwise indistinguishable from, typical *S. lepcha* from the North-West Himalayas. The North Chin Hills may therefore be considered to be one of the meeting places of the two local races, which in their extreme habitats are constant and well defined.

26. MYCALESIS (Samanta) NICOTIA, Hewitson.

A single much-battered male of the dry-season form from 3,500 feet in June, and a second male from Manipur; also a female of the rainy-season form from 3,500 feet in September.

27. MYCALESIS (Myrtilus) MYSTES, de Nicéville.

Eight males and three females of the dry-season form from the Upper Chindwin in March and April. This species is very locally distributed, and even where it occurs is only found within very limited areas.

28. LETHE (Rangbia) LATIARIS, Hewitson.

A single male from 3,500 feet in May. This specimen differs slightly from others in my collection from the Khasi Hills in that the white pupils of the ocelli on the underside of the hindwing are disintegrated, that the subapical ocellus almost touches the discal reddish-brown line instead of being well separated from it, and that all four ocelli on the underside of the forewing are white-pupilled.

29. LETHE (Nemetis) MINERVA, Fabricius.

Not uncommon in the Upper Chindwin from March to May, but difficult to obtain absolutely perfect.

30. LETHE (Debis) MEKARA, Moore.

Occurs fairly commonly in company with the preceding species.

31. LETHE (Debis) CHANDICA, Moore.

A single male at the foot of the hills in May, and a single female in the Upper Chindwin in March.

32. LETHE (Debis) VINDHYA, Felder.

A single male in the Upper Chindwin in March.

33. LETHE EUROPA, Fabricius.

Common in the Upper Chindwin; not seen in the hills.

34. LETHE DRYTA, Felder.

A single male from the Upper Chindwin in May, and a second male, from 5,500 feet in April.

35. LETHE ROHRIA, Fabricius.

Fairly common in the Upper Chindwin, and a single specimen from 3,500 feet in June.

36. LETHE (Tansima) VERMA, Kollar.

Two specimens from 5,500 feet in May, and also from Manipur.

37. LETHE (Sinchula) SIDONIS, Hewitson.

Two quite typical males from Manipur.

38. PATALA YAMA, Moore.

A single pair from 5,000 feet in May. These specimens had evidently just emerged, and the species probably occurred more commonly later in the year. Presumably the form found in the Chin Hills belongs to the local race named *P. yamoides* by Moore, but my specimens agree in some points with *P. yama*, and in others with *P. yamoides*, so that the local race does not seem of much value even as a local race, and identification is rendered more difficult by the fact that the figures given of the two races do not bear out the descriptions.

39. PATALA BHIMA, Marshall.

Common in the Upper Chindwin in April, but only on the wing for about three weeks in good condition.

40. YPTHIMA BALDUS, Fabricius.

Common in the Upper Chindwin and up to 3,500 feet; the dry-season form in March and the rainy-season form from April to June. Mr. Elwes, in his recent revision of *Ypthima*, tries to prove that the true *Y. baldus* of Fabricius is the *Y. tabella* of Marshall and de Nicéville. His chain of argument is however very weak, and he has quite overlooked the fact that in the Banksian Collection in the British Museum, which is said to contain many of Fabricius' types, there is an *Ypthima* which, if not Fabricius' type of *Y. baldus*, was, at any rate, almost certainly identified by Fabricius as *Y. baldus*, and is so labelled. This is certainly stronger proof of the identity of the true *Y. baldus* than the arguments brought forward by Elwes, which are based first on a figure of Donovan (quite probably erroneous) of the *P. baldus* of Fabricius, which figure is "a fair representation" of the species hitherto known as *Y. tabella*, and secondly on a specimen of *Y. tabella* in the Godman-Salvin collection which is labelled "*Lisander*, Cr." "on a manuscript label evidently of the Fabrician period," the *P. lysandra* of Cramer having been placed by Westwood as a synonym

of *P. baldus*, Fabricius. If, therefore, Donovan was correct in his figure, Westwood in his synonymy, and the writer of the manuscript label correct in his identification of *P. lysandra*, Cramer, then Elwes' conclusion is undoubtedly correct and *Y. tabella* should fall as a synonym of *Y. baldus*; we, however, cannot accept this as correct in the face of the specimen in the Banksian collection referred to above, which, we consider, is much more likely to be a specimen of the true *Y. baldus*; this specimen belongs to the common Indian species described in the "Butterflies of India" as *Y. philomela*, Johannsen. With regard to the latter species there are in the British Museum specimens of an *Ypthima* from Java identified as *Y. philomela*, apparently quite correctly as they agree very well with the original description, and judging from Elwes' paper are *Y. stellara*, Eschscholtz, which would, therefore, fall as a synonym of *Y. philomela*. We think then that the common Indian species should stand as *Y. baldus*, Fabricius, and that the smaller Javan species should stand as *Y. philomela*. Mr. de Nicéville informs me that he considers the species described by Marshall as *Y. tabella* is identical with the Javan species here identified as *Y. philomela*.

41. YPTHEMA METHORA, Hewitson.

A single, rather worn, pair of the dry-season form of this species from 5,000 feet in May.

42. YPTHEMA SAVARA, Grose Smith.

The dry-season form was exceedingly common during March and April in the Upper Chindwin, and also in the hills up to 1,500 feet.

43. YPTHEMA SAKRA, Moore. (Plate A, Fig. 2, ♂.)

Four males and one female taken in the North Chin Hills at an elevation of from 5,000 to 5,500 feet; also two males from Manipur. The Chin specimens differ from typical *Y. sakra* in the much greyer tone and more even striation of the underside; in *Y. sakra* the ground-colour is distinctly ochreous and the striation is irregular, being especially sparse towards the margins; in the Chin race also the two subanal ocelli on the underside of the hindwing are nearer the margin than in typical *Y. sakra*, and consequently are more in line with the anal ocellus. These differences appeared to me at first to be sufficient to warrant the form being named as a local race, but a subsequent examination of the specimens from Manipur makes it clear that the Chin Hill

race cannot be retained as distinct since the Manipur specimens are in all points intermediate between Chin Hill and Khasi Hill specimens, and it is impossible to say to which race they should be assigned.

44. *YPHTIMA AVANTA*, Moore.

Common in the Upper Chindwin, the dry-season form from March to May, and the rainy-season form in May. This species varies greatly in the development of the ocellus on the upper side of the forewing, which is found in all stages from entire absence to an almost perfect ocellus. There seems to be some mystery about the allied *Y. singala*. Both Moore and de Nicéville describe it as without any male-mark. Elwes says "neither sex is distinguishable on the upper side from *Y. avanta*," so he apparently recognises as *Y. singala* some species with a male-mark, since the male-mark is very strongly developed in *Y. avanta*. Then again Moore confines *Y. singala* to Ceylon, while de Nicéville and Elwes record it from Northern India as well as from Ceylon; I also have in my collection specimens of an *Ypthima* of this group from the Himalayas, which are certainly not *Y. avanta*, as the males have no male-mark.

I take this opportunity to describe a new species of *Ypthima* belonging to this group recently taken by me in some numbers at Myingyan in Upper Burma.

YPHTIMA CEREALIS, n.sp. (Plate A, Fig. 4 ♂, rainy-season form,
Fig. 3 ♂, dry-season form.)

HABITAT: Myingyan, Upper Burma.

EXPANSE: ♂, 1·3; ♀, 1·4 inches.

Rainy-season Form.

DESCRIPTION: MALE. UPPERSIDE, *both wings* uniform dark brown irrorated with greyish at the anal angle of the hindwing. *Forewing* with faint traces of a sexual brand, a rather large subapical ocellus conspicuously bipupilled with silver. *Hindwing* with two subanal ocelli between the median branches, and two minute anal ocelli, one or both of the latter frequently wanting. UNDERSIDE, *both wings* greyish-white, striation dark brown, fine and regular. *Forewing* with a very prominent subapical ocellus, and faint traces of a discal fascia. *Hindwing* with six ocelli arranged in pairs, the anal two pairs in line, all with silvery pupils; striation even, with no tendency to form fasciæ. FEMALE. UPPERSIDE, *both wings* obscurely paler towards the margins,

the sub-apical ocellus on the forewing more prominent. UNDERSIDE, the discal fascia of the *forewing* more prominent than in the male, and faint traces of a similar fascia on the *hindwing*, otherwise as in the male.

Dry-season Form.

DESCRIPTION : MALE and FEMALE. UPPERSIDE, *forewing*, ocellus less conspicuous than in the rainy-season form, but always present and fairly prominent. UNDERSIDE, *both wings*, discal fascia rather prominent and also faint traces of a marginal and submarginal fascia. *Hindwing*, ocelli minute, but with conspicuous silver pupils.

Described from five males and four females of the rainy-season form taken at Myingyan at the end of November and beginning of December, and from very numerous specimens of both sexes of the dry-season form taken from the end of December to March. The rainy-season specimens do not represent the extreme of that form, and would not have been taken so late in the year if it had not rained on the 28th and 30th November, exceptionally late dates for Myingyan. The last specimen of the rainy-season form was taken on the 10th December, and the first of the dry-season form on the 28th of the same month.

This is a well-defined local race of *Y. avanta*, Moore, from a treeless district, the typical race being confined, in Burma at all events, to heavy jungle ; the present race differs in its smaller size, in the constant presence of the ocellus on the upperside of the forewing, in the white tone and less prominent fasciæ on the underside, and in the almost entire absence of *androconia* on the forewing of the male. In typical *Y. avanta* the ocellus on the upperside of the forewing is, especially in the males, ill-defined or entirely absent ; the fasciæ on the underside are conspicuous, and the male-mark is almost more prominent than in any other species of the genus. In some ways *Y. cerealis* seems to bear the same relation to *Y. avanta*, that *Y. philomela* (= *tabella*) does to *Y. balbus*.

The distribution of the present species seems very restricted even in the localities where it occurs, and it was only found within certain limited areas. It occurred especially abundantly among low bushes on the bunds of some paddy fields a few miles out of Myingyan.

The types of both seasonal forms are in the collection of Mr. de Nicéville.

45. *YPHIMA HUEBNERII*, Kirby.

The dry-season form was common in the Upper Chindwin in March and April, and the rainy-season form in June. I also obtained a single specimen which appears to belong to the dry-season form of this species at 5,500 feet in February.

46. *YPHIMA NEWARA*, Moore.

Numerous specimens at from 3,500 to 5,500 feet in May and June, and others from Manipur. These specimens differ slightly from typical *Y. newara* in being practically without the submarginal fascia on the underside; also the subapical ocellus on the underside of the hindwing appears even larger than in typical *Y. newara*. The specimens do not appear to vary *inter se*, except that the two anal ocelli on the underside of the hindwing are either entirely separated or partly geminated, and that the anal ocellus on the upperside of the hindwing is either present or absent.

47. *YPHIMA LYCOIDES*, n. sp.

HABITAT: North Chin Hills, Burma.

EXPANSE: ♂, 1.5, ♀, 1.65 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* uniform dark brown; *cilia* greyish-brown. *Forewing* with a small black bipupilled ocellus with an indistinct pale ochreous outer ring, a broad dark patch of differently-formed scales extending from the inner margin to the middle of the disc, most clearly visible when the insect is held up to the light. *Hindwing* with a small perfect ocellus in the lower median interspace. UNDERSIDE, *both wings* greyish-white, finely and densely striated throughout with brown. *Forewing*, ocellus as on the upperside but more prominent. *Hindwing* with a fairly large subapical ocellus, a smaller one in the lower median interspace, and a still smaller bipupilled one at the anal angle; all the ocelli black with silvery pupil and prominent yellow outer ring, outside of which is a pale brown ring varying in breadth individually. FEMALE. UPPERSIDE, *forewing* differs from the male in the ocellus being larger and better defined, and in being obscurely irrorated with greyish-white towards the margins of *both wings*.

Falls into the second group of *Ypthima* as revised by Elwes and Edwards. The relative size of the ocelli on the underside of the hindwing, and the presence of a male-mark on the upperside of the

forewing will distinguish the present species from all the others of the group except the first eight as enumerated by the above-named writers. From *Y. motschulskyi* it may be distinguished by its smaller size and by the absence of the dark submarginal lines on the upperside; from *Y. imitans* and *Y. obscura* by the regular striation of the underside; from *Y. multistriata* by the presence of the ocellus on the upperside of the forewing; and from *Y. prænubila* and *Y. perfecta* by the ocellar space on the underside of the forewing not being defined.

Nearest to *Y. sordida* and *Y. lycus*. From the former it differs on the underside in the subapical ocellus on the hindwing being considerably smaller than that on the forewing, and also in the fine even striation; from *Y. lycus* it differs in the entirely different tone of the underside, which in that species is yellowish-brown, and in *Y. lycoides* greyish-white with occasionally the very faintest tinge of ochreous. In *Y. lycus* also the discoidal cell and basal portions of the median interspaces on the underside of the forewing are almost without striations, while in *Y. lycoides* the median interspaces are striated throughout, and the cell almost to the base of the wing.

Described from nine males and one female taken in the North Chin Hills during May at an elevation of from 3,500 to 5,500 feet.

Two males present slight variations. In one there is an additional small ocellus on both sides of the forewing in the lower median interspace, and in the other the ocellus on the upperside of the forewing is without the usual two silvery pupils, and there is no ocellus on the upperside of the hindwing.

48. *YPTHIMA WATSONII*, Moore.

Very numerous males and females of the rainy-season form in April and May, and an intermediate seasonal form in April, all from Kalewa, in the Upper Chindwin District; also a single male of the dry-season form from 1,500 feet in May.

I am inclined to think that there are two species combined under this name. The species was named by Moore from some specimens of the dry-season form obtained by me in the Karen Hills, near Toungoo, and Elwes, in his revision of *Ypthima*, gives a description of the dry-season form from specimens collected by Doherty in the same locality. Moore in "Lepidoptera Indica," part 16, which appeared almost simultaneously with Elwes' paper, describes both seasonal forms and

records the species from Lower Burma, the Karen Hills, Bhamo, the Shan States and the Upper Chindwin; his description of the dry-season form does not agree very well with that of Elwes, nor does it agree, as far as I remember, with my Karen Hill specimens which are now in the British Museum, and as his descriptions of both forms agree perfectly with my Upper Chindwin specimens, it seems probable that they were taken from Chindwin specimens; and I am inclined to believe that the Karen Hill specimens, and probably the Shan Hill ones as well, will be found to belong to a species distinct from the western one.

The present species was excessively local at Kalewa, and was only on the wing in one spot from the middle of April to the middle of May. The dry-season form was probably on the wing in the same locality earlier in the year, but previous to April I had no opportunity of visiting the portion of jungle in which it occurred. The single specimen of the dry-season form obtained at the foot of the hills was caught while I was on the march, and the species probably occurred in some numbers in that locality.

49. *YPHTIMA ASTEROPE*, Klug.

Ten specimens of both sexes of the dry-season form taken at 5,500 to 7,000 feet from February to April, and a single male of the rainy-season form at 5,000 feet in May. In some of the dry-season specimens the ocelli are only traceable with a glass.

The specimens differ from typical *Y. asterope* (*Y. mahratta*) from the Deccan and Mysore in the obsolescence, and in some cases entire absence, of the brown fasciæ defining the ocellar space on the underside of the forewing; this is a noteworthy difference, and I can find no record of its occurrence in specimens from any other locality. The form is, however, not deserving of a name, even as a local race, as in some specimens the ocellar space is almost as clearly defined as in typical Indian specimens, and there is no doubt that in this particular locality the character is a variable one. This species has an immense range, occurring from South Africa to China, but as far as the Indian region is concerned, has not been previously recorded east of Orissa. De Nicéville and Elwes consider *Y. mahratta*, Moore, to be synonymous with *Y. asterope*, Klug, while Moore and Swinhoe are of the opposite opinion; but neither of the latter have ever pointed out how *Y. mahratta*

differs from *Y. asterope*, and when the former was originally described it was compared with *Y. ariaspa*, *Y. rara* (*ariaspa*) and *Y. norma*, but not with *Y. asterope*.

50. *YPETHIMA IARBA*, de Nicéville. (Plate A, Fig. 5, ♂.)

A single male of the species was obtained by Captain Longe, R.E., in Manipur. I described it as new and sent the type to Mr. de Nicéville and found he had just described it from N.-E. Sumatra under the above name. Its nearest ally is probably *Ypthima baldus*, Fabricius, but the ocelli on the underside are arranged as in *Ypthima huebnerii*, Kirby. There is no male-mark perceptible on the upperside.

51. *CALLEREBIA ORIXA*, Moore.

Not uncommon at from 3,500 to 5,500 feet in May and June.

52. *ZIPCETES SCYLAX*, Hewitson.

Common, but very local, both at the foot of the hills and in the Upper Chindwin during April. Only found near water.

53. *ERITES FALCIPENNIS*, Wood-Mason and de Nicéville.

A single damaged specimen taken in the Upper Chindwin in April.

54. *MELANITIS ISMENE*, Cramer.

55. *MELANITIS BELA*, Moore.

56. *MELANITIS ZITENIUS*, Herbst.

The above-named three species of *Melanitis* occurred commonly in the Upper Chindwin, but were not seen in the hills.

Subfamily ELYMNIINÆ.

57. *ELYMNIA UNDULARIS*, Drury.

The form named *E. tinctoria* by Moore was common in the Upper Chindwin.

58. *ELYMNIA* (*Melynia*) *PATNA*, Westwood.

A single male from the Upper Chindwin in May. Though this particular specimen belongs to the form *M. patnoides*, Moore, yet I do not think that name should be admitted, since a single male in my collection from Assam also belongs to the form *patnoides* and not to typical *M. patna* as one would expect from the locality. In this connection I may state that the male *M. vasudeva*, recorded by me from Upper Tenasserim and referred to by Mr. Moore in his description of *M. burmensis* in "Lepidoptera Indica," part 19, is a typical male of *M. vasudeva*, and agrees exactly with Moore's figure of that species on Plate 142, figure 1, and does not at all agree with the

figures of the form named by him *M. burmensis*. The specimen in question is now in my collection and has never been examined by Mr. Moore, who assigned it to the form *M. burmensis* merely owing to its locality.

Subfamily AMATHUSINÆ.

59. DISCOPHERA SPILOPTERA, Möller and de Nicéville.

Fairly common at Kalewa in March and April and at the foot of the hills in April. Some of the specimens might, perhaps, be referred more appropriately to *D. zal*; there, however, appears to be little doubt that both these names apply only to the dry-season form of *D. tullia*.

60. ENISPE EUTHYMIUS, Doubleday.

A single specimen caught at 2,000 feet in May sitting on a tree-trunk.

61. THAUMANTIS DIORES, Doubleday.

A single male of the form *T. ramdeo* at 3,500 feet in June.

62. THAUMANTIS PSEUDALIRIS, Butler.

A single specimen taken at the foot of the hills in May.

63. MELANOCYMA FAUNULOIDES, de Nicéville.

Three females at 3,500 feet in June.

Subfamily ACRÆINÆ.

64. PAREBA VESTA, Fabricius.

Common at from 3,500 to 5,000 feet in the rains.

Subfamily NYMPHALINÆ.

65. ERGOLIS MERIONE, Cramer.

66. ERGOLIS ARIADNE, Linnæus.

Both the above occurred commonly in the Upper Chindwin, but were not noticed in the hills.

67. EURIPUS HALITHERSES, Doubleday and Hewitson.

Two males and a female of the form *cinnamomeus* were taken at 3,500 feet in June.

68. ATELLA SINHA, Kollar.

Occurred rather rarely in the hills up to 3,500 feet.

69. ATELLA PHALANTHA, Drury.

Common in the Upper Chindwin and Manipur.

70. CETHOSIA BIBLIS, Drury.

A few specimens at 3,500 feet from May to August.

71. CETHOSIA CYANE, Drury.

Common at 3,500 feet during the rains.

72. *CYNTHIA EROTA*, Fabricius.

A few males at the foot of the hills in the rains.

73. *DILIPA MORGIANA*, Westwood.

A single male of this rare species was caught at about 7,500 feet, flying round the extreme peak of one of the hills near Fort White.

74. *APATURA AMBICA*, Kollar (*NAMOUNA*, Doubleday).

A single male at the foot of the hills in July, and two males at 3,500 feet in the rains. One of the latter is a curious melanistic variety ; on the upperside the two spots just beyond the discoidal cell on the forewing are almost entirely wanting, and the discal band on the hindwing is also obsolescent ; on the underside the brown marginal band on both wings is very broad and inwardly diffused instead of sharply defined, the yellow patch towards the outer angle of the forewing is much reduced in size, and the white medial band on the hindwing is entirely wanting. It is nearest to the variety named *A. zanoa* by Hewitson.

75. *HESTINA NAMA*, Doubleday.

A few specimens at from 3,500 to 5,000 feet in May and June.

76. *PRECIS IPHITA*, Cramer.77. *JUNONIA ALMANA*, Linnæus.78. *JUNONIA ATLITES*, Linnæus.79. *JUNONIA LEMONIAS*, Linnæus.80. *JUNONIA HIERTA*, Fabricius.81. *JUNONIA ORITHYIA*, Linnæus.

The last six species occurred commonly in the Upper Chindwin and in Manipur ; *P. iphita*, *J. lemonias*, and *J. hierta* also occurred in the hills up to 3,500 feet, and *J. orithyia* up to 6,000 feet.

82. *NEPTIS HORDONIA*, Stoll.

Common in the Upper Chindwin and Manipur.

83. *NEPTIS PERAKA*, Butler.

Three specimens in the Upper Chindwin in April and May.

84. *NEPTIS TIGA*, Moore.

Not uncommon in the Upper Chindwin from March to May. *N. sat-tanga*, Moore, is identical with this species.

85. *NEPTIS CARTICA*, Moore.

A single specimen at the foot of the hills in March.

86. NEPTIS LEUCOTHOË, Cramer.

Common in the Upper Chindwin. This is the name under which *N. varmona*, Moore, should stand.

87. NEPTIS ASTOLA, Moore.

Common at from 3,000 to 7,000 feet. This appears to be a hill race of *N. leucothoë*, to which the specimens from lower elevations are very close.

88. NEPTIS NANDINA, Moore (SOMA, Moore.)

Two specimens from the Upper Chindwin in May, and two from 3,500 feet in the rains.

89. NEPTIS KHASIANA, Moore.

A single specimen from the foot of the hills in March. *N. cineracea*, Grose-Smith, appears to be identical with this species.

90. NEPTIS MARTABANA, Moore.

Two specimens of the dry-season form from Kalewa in March. This is the Burmese representative of *N. ophiana*, Moore, from which it appears to be distinct; at least there certainly appear to be two species confused under *N. ophiana*, and, as *N. martabana* was described from Burma, it seems better to use that name for the present species than one which probably does not apply. True *N. ophiana* is very possibly identical with *N. columella*, Cramer.

91. CIRRHODROA MITHILA, Moore.

Fairly common in the hills up to 5,000 feet during May and June, and very common later in the year; also received from Manipur. The medial transverse lines on the underside of both wings vary greatly in intensity, being hardly traceable in some specimens, and a deep purplish-black in others. This variation does not appear to be seasonal, as I have both forms taken in June and throughout the rains. The broad silvery transverse band is also very variable both in width and in coloration, being brilliant silvery in some specimens and almost concolorous with the ground-colour of the wing in others; the silvery tint is more obsolescent in the rainy season specimens than in those taken in May, so may possibly be seasonal. In only three specimens are the bands and spots ochre-yellow, in all the others they are tawny; these latter are therefore typical *C. rotundata*, Butler. I am, however, quite certain that all the specimens belong to one species only, which should stand as *C. mithila*.

92. *PSEUDERGOLIS WEDAH*, Kollar.

A single specimen at the foot of the hills in March. This species appears to be very rare in Burma.

93. *HYPOLIMNAS BOLINA*, Linnæus.

Common in the Upper Chindwin and at the foot of the hills; also from Manipur.

94. *ARGYNNIS NIPHE*, Linnæus.

Occurs rather rarely in May and June from 3,500 feet upwards, but is probably commoner later in the year. It appears to be common in Manipur.

95. *PARTHENOS GAMBRISIUS*, Fabricius.

A few specimens seen at the foot of the hills.

96. *LEBADEA ATTENUATA*, Moore.

Rare in the Upper Chindwin in May.

97. *LIMENITIS DARAXA*, Doubleday and Hewitson.

A single male at 3,500 feet in the rains.

98. *LIMENITIS DUDU*, Westwood.

A single male taken at 5,000 feet in May.

99. *LIMENITIS* (*Moduza*) *PROCRIS*, Cramer.

Occurs rather rarely in the Upper Chindwin, and at the foot of the hills from May to July.

100. *ATHYMA PERIUS*, Linnæus.

Occurs commonly in the Upper Chindwin, and a single specimen was taken at 5,500 feet in February.

101. *ATHYMA OPALINA*, Kollar.

A single specimen taken at 5,000 feet in May. Markings as narrow as in the Sikkim race *orientalis*, Elwes, but pure white.

102. *ATHYMA CAMA*, Moore.

A single female at 7,000 feet in April.

103. *ATHYMA INARA*, Doubleday and Hewitson.

A single male of the typical form with broad yellow markings in the Upper Chindwin in February.

104. *ATHYMA SELENOPHORA*, Kollar.

Fairly common in the Upper Chindwin and at the foot of the hills.

105. *EUTHALIA* (*Lexias*) *DIRTÆA*, Fabricius.

Not uncommon in the Upper Chindwin.

106. *EUTHALIA* (*Felderia*) *LEPIDEA*, Butler.

107. EUTHALIA GARUDA, Moore.

A few specimens only of each of the preceding seen in the Upper Chindwin.

108. EUTHALIA LUBENTINA, Cramer.

A single female in the Upper Chindwin in June. This genus was very poorly represented, and there are several other species which one would expect to have occurred.

109. PYRAMEIS CARDUI, Linnæus.

Common at high elevations ; also from Manipur.

110. PYRAMEIS INDICA, Herbst.

Occurred rather rarely in company with the preceding up to the end of May. I have since been told that it was commoner later in the year.

111. VANESSA CANACE, Linnæus.

Occurred rarely in the hills up to 3,500 feet.

112. SYMBRENTHIA HIPPOCLUS, Cramer.

A few specimens obtained in the Upper Chindwin in February and March, and at 3,500 feet during June ; also from Manipur.

113. SYMBRENTHIA NIPHANDA, Moore.

A single specimen in the Upper Chindwin in April.

114. RHINOPALPA VASUKI, Doherty.

Occurred commonly in the Upper Chindwin in April, but almost invariably in bad condition, and also very difficult to catch.

115. CYRESTIS THYODAMAS, Boisduval.

A few specimens taken in the hills up to 3,500 feet from March to June.

116. CYRESTIS (Chersonesia) RAHRIA, Moore.

Occurred rarely in the Upper Chindwin.

117. KALLIMA LIMBORGII, Moore.

A single male from 3,500 feet in the rains.

118. CHARAXES (Eulepis) EUDAMIPPUS, Doubleday.

A few specimens at the foot of the hills in April.

119. CHARAXES (Eulepis) ATHAMAS, Drury. (Form *bharata*, Felder).

Occurred, but not commonly, both in the Upper Chindwin and at the foot of the hills.

120. CHARAXES (Eulepis) ARJA, Felder.

A single specimen from 2,000 feet in February.

121. *CHARAXES FABIUS*, Fabricius.

A single specimen at the foot of the hills in April.

122. *CHARAXES* (Haridra) *HIPPONAX*, Felder.

Captain Longe, R.E., obtained several males of this species on the Manipur river at 2,000 feet, some of the specimens are of the form identified as typical *C. hipponax*, Felder, in "Lepidoptera Indica," and others belong to the forms identified as *C. hindia*, Butler, and *C. jalinder*, Butler. I think there can be little doubt that all these forms belong to one species. This species was also obtained from Manipur.

Family LEMONIIDÆ.

Subfamily LIBYTHÆINÆ.

123. *LIBYTHEA MYRRHA*, Godart.

A single specimen of the typical form, taken at 3,500 feet in June, and one of the form *L. rama*, Moore, at 5,000 feet in May.

124. *LIBYTHEA LEPITA*, Moore.

A single quite typical specimen taken at 5,000 feet in May ; also from Manipur.

Subfamily NEMEOBIINÆ.

125. *ZEMEROS FLEGYAS*, Cramer.

Occurred commonly in the Upper Chindwin and up to 3,500 feet in the hills ; also from Manipur.

126. *TAXILA FASCIATA*, Moore.

A single much broken male taken in the Upper Chindwin in April.

127. *ABISARA NEOPHRON*, Hewitson.

A single specimen in the Upper Chindwin in April.

128. *ABISARA ECHERIUS*, Stoll.

A single male taken at 7,000 feet in April, nearest to the form *A. suffusa*, Moore ; also from Manipur. A female taken at 3,500 feet the rains has all the white markings on the forewing very prominent.

Family LYCÆNIDÆ.

129. *GERYDUS BIGGSII*, Distant.

Not uncommon in the Upper Chindwin ; only females obtained. The specimens vary very considerably, one extreme has the whole upperside brown, the outer margin of the forewing and costa of the hindwing darker, with a well-defined white band across the forewing ; this form is the one figured by Distant ; in the other extreme the

outer margin of the forewing and costa of the hindwing are similarly dark brown, but the whole of the remainder of both wings is white with the exception of a dark fascia on the forewing running along the median vein and widening out into an ill-defined spot at the first median branch. There seems no doubt that these two forms belong to one species, as not only are the markings of the underside identical, but other specimens are distinctly intermediate between the two extremes. The white form I recorded as *G. symethus* in my paper on Yaw Butterflies on the identification of Mr. de Nicéville, but having since seen specimens of the true *G. symethus* I find the identification was wrong.

130. *GERYDUS BOISDUVALII*, Moore.

Occurs rather rarely in company with the preceding.

131. *PORITIA HEWITSONII*, Moore.

Two males in the Upper Chindwin in May and June.

132. *PITHECOPS HYLAX*, Fabricius.

133. *NEOPITHECOPS ZALMORA*, Butler.

Both the above occurred fairly commonly in the Upper Chindwin from March to May, the latter species the commoner.

134. *SPALGIS NUBILUS*, Moore.

Two specimens from the Upper Chindwin in May.

135. *TARAKA HAMADA*, Druce.

A single specimen at Kalewa in May.

136. *CHILADES TROCHILUS*, Freyer.

Common in the Upper Chindwin from March to May.

137. *CYANIRIS PUSPA*, Horsfield.

Common in the Upper Chindwin in April and May, and in the hills up to 5,000 feet in May and June.

138. *CYANIRIS CHENNELLI*, de Nicéville.

A single female at 5,000 feet in March, in no way differing from a Shillong female in my collection ; the rounded spots on the underside render this species easy to identify.

139. *CYANIRIS PLACIDA*, de Nicéville.

Three males at the foot of the hills and a female at 5,000 feet during May. The female appears to be undescribed ; it is entirely without white markings on the upperside ; the costal and outer margins of the forewing are broadly fuscous ; the whole of the disc and lower half of

the discoidal cell shining blue, the coloration starting from the extreme base of the wing and extending along the inner margin as far as the marginal band; the hindwing has the costa broadly fuscous, and the outer margin more narrowly so, with an inner row of faint fuscous lunules; the remainder of the wing is of a similar tone of blue to that on the forewing. The markings on the underside are identical with those of the male.

140. *CYANIRIS JYNTEANA*, de Nicéville.

Numerous specimens from the foot of the hills up to 7,000 feet from March to May; also a single male from the Upper Chindwin in February.

141. *CYANIRIS DILECTUS*, Moore.

Numerous specimens from the foot of the Hills up to 7,000 feet from March to May, and a single male from the Upper Chindwin in March. In this species the males never seem to have more than four discal spots on the underside of the forewing in addition to the costal spot, and in one specimen there are only three. The females have either four or five discal spots; they can be readily distinguished from the females of all other species of *Cyaniris* which occur in the Chin Hills by the markings on the underside of the hindwing which do not differ from those of the male. The peculiar tone of blue on the upper-side of the male renders this species very easy to recognise. In all the species of the genus which occur in the hills, the males are found for the most part at low levels usually along the streams in the valleys, while the females prefer high elevations, and are found on the loftiest ridges and grassy plateaus.

142. *PHENGARIS ATROGUTTATA*, Oberthür.

Surgeon-Captain Graves obtained a single specimen at 3,500 feet in the rains. The species was met with commonly by Mr. Doherty in the Naga Hills, but there is no other record of its occurrence within Indian limits. The specimen appears to be quite typical.

143. *ZIZERA MAHA*, Kollar.

Occurs rarely at high elevations.

144. *ZIZERA LYSIMON*, Hübner.

Common in the Upper Chindwin.

145. *ZIZERA GAIKA*, Trimen.

Common in the Upper Chindwin.

146. *ORTHOMIELLA PONTIS*, Elwes.

Two specimens at 7,000 feet in April. Rather small, but otherwise quite typical. A common species on the Chinese Frontier east of Bhamo.

147. *LYCÆNESTHES EMOLUS*, Godart.

148. *LYCÆNESTHES LYCÆNINA*, Felder.

Both the above were common in the Upper Chindwin and at the foot of the hills.

149. *EVERES ARGIADES*, Pallas.

The form *parrhasius* was common in the Upper Chindwin. On the top of the hills, at an elevation of from 5,000 to 7,000 feet, a smaller form close to that named *dipora* by Moore occurred in great numbers; in this form the tails were frequently wanting as in the specimens obtained by Doherty * in the Naga Hills.

150. *NACADUBA MACROPHTHALMA*, Felder.

A single male at the foot of the hills in May.

151. *NACADUBA CÆLESTIS*, de Nicéville.

A single male at the foot of the hills in May.

152. *NACADUBA BHUTEA*, de Nicéville.

A single male from 3,500 feet in June.

153. *NACADUBA NOREIA*, Felder, (*ARDATES*, Moore.)

The tailed form occurred commonly in the Upper Chindwin and in the hills up to 3,500 feet from April to June, and I have a single male from 7,000 feet which is larger than usual and also differs slightly in the markings of the underside, and I think it very possible that it belongs to a distinct species, but *N. noreia* is either very variable or more than one species is included under the name. The tailless form appears to be much rarer in this district, and I only obtained four males—three from the Upper Chindwin in February and March and one from 3,500 feet in June.

154. *NACADUBA DANA*, de Nicéville.

Taken in the Upper Chindwin in March, and also at 3,000 feet in the hills.

155. *JAMIDES BOCHUS*, Cramer.

Common in the Upper Chindwin and up to 3,500 feet in the hills.

* Proc. Zool. Soc. London, 1891, p. 251; *id.*, 1892, p. 624.

156. *LAMPIDES CELENO*, Cramer (*ÆLIANUS*, Fabricius).

Common in the Upper Chindwin and up to 3,500 feet in May and June.

157. *LAMPIDES CLEODUS*, Felder (*PURA*, Moore.)

A single male from the Upper Chindwin in April.

158. *LAMPIDES*, n. sp.

A single male from 7,000 feet in April. Mr. de Nicéville informs me that this specimen is "nearest to *L. kondulana*, Felder, but differs in having a broad black margin on the upperside; in true *L. kondulana* there is a black thread only. The ground-colour of the underside is also redder, but the striation is identical." I have received a second male from Katha, Upper Burma, but do not consider it advisable to name the species at present.

159. *CATOCORYSOPS STRABO*, Fabricius.

Common in the Upper Chindwin and in the hills up to 3,500 feet.

160. *CATOCORYSOPS CNEJUS*, Fabricius.

Common in the Upper Chindwin, but not noticed in the hills.

161. *CATOCORYSOPS PANDAVA*, Horsfield.

This species together with its dwarf form *C. contracta* was common in the Upper Chindwin in April and May.

162. *TARUCUS PLINIUS*, Fabricius.

Common in the hills up to 7,000 feet.

163. *CASTALIUS ROSIMON*, Fabricius.

Common in the Upper Chindwin.

164. *CASTALIUS DECIDIA*, Hewitson.

A few specimens at the foot of the hills in March.

165. *CASTALIUS ROXANA*, de Nicéville.

A single specimen from the foot of the hills in March. Nearest to *C. roxus*, Godart. On the upperside the white markings are more extensive, and on the underside of the hindwing the central one of the three submarginal spots consists of two instead of three conjoined spots, the anterior one being wanting. Colonel Adamson records a species of *Castalius* allied to *C. roxus* from the Chindwin District, and probably refers to the present species. I have also received a specimen from the Chinese frontier east of Bhamo. True *C. roxus* has not been recorded from further north than the Karen Hills.

166. *CASTALIUS ANANDA*, de Nicéville.

A single male at 3,500 feet in June. This species would appear to be more suitably located in the genus *Tarucus*, Moore, as it agrees much better in markings with species of that genus than with species of *Castalius*, and the marking is the only point on which Mr. de Nicéville has been able to separate the two genera in "The Butterflies of India, &c." As however the differences in neuration and shape of wing, on which Moore separated *Tarucus* from *Castalius*, are not even specific, but rather individual, and since both genera are practically coincident in range and identical in habits, their separation is of doubtful value.

167. *POLYOMMATUS BETICUS*, Linnæus.

Common in the hills up to 7,000 feet.

168. *SURENDRA QUERCETORUM*, Moore.

Common in the hills up to 3,500 feet.

169. *ARRHOPALA CENTAURUS*, Fabricius.

Common in the Upper Chindwin from April to June ; also from Manipur.

170. *ARRHOPALA AMATRIX*, de Nicéville.

Three females in the Upper Chindwin during May and June.

171. *ARRHOPALA ABSEUS*, Hewitson.

Six specimens in the Upper Chindwin in May. These differ from typical *A. abseus* in their smaller size, and in the purple colour on the upperside of both wings being more restricted. The underside is darker, especially the hindwing, and the markings are consequently less prominent ; there is no costal white spot on the hindwing, but in its place a square spot rather lighter than the rest of the ground-colour of the hindwing but of about the same tone as the ground-colouring of the forewing. The above differences, though constant in the six specimens obtained, do not appear sufficient to separate this form even as a geographical race, especially as typical *A. abseus* occurs a little further south.

172. *ARRHOPALA ATRAX*, Hewitson.

Two specimens from the Upper Chindwin in May.

173. *ARRHOPALA*, sp.

Two specimens—one from 5,000 feet in May and the other from 3,500 feet in June. Nearest to *A. atrax* and *A. alemon*, but not agreeing

ing with either or with each other in the distribution or extent of the blue on the upperside or in the tone of the underside. This is a very confusing section of the genus and contains, in my opinion, several distinct but unnamed species which are practically identical in the markings of the underside, but differ considerably in the tone and extent of the blue on the upperside, and also in the brilliancy or entire absence of gloss on the underside.

174. *ARRHOPALA AGABA*, Hewitson.

Four males from the Upper Chindwin in May.

175. *ARRHOPALA TEESTA*, de Nicéville.

Two females taken at 5,000 feet in May.

176. *ARRHOPALA FULGIDA*, Hewitson.

A single female from 3,500 feet in May in no way differing from a Sikkim female in my collection.

177. *ARRHOPALA HELLENORE*, Doherty.

Both sexes common at from 2,000 to 4,000 feet from March to the end of the rains. This appears to be a quite distinct species from *A. eumolphus*, Cramer, the male differing on the upperside in the greater extent of the green colour and narrower dark margins on both wings, the underside also being conspicuously washed with white much as in *A. bazalus*, Hewitson, while all the spots are much larger than in *A. eumolphus*; the female agrees with the male on the underside except that the white washing is less conspicuous, and both sexes are entirely without the bronzy gloss found in *A. eumolphus*; on the upperside the female is even more distinct, as the blue is not only less purple than in *A. eumolphus*, but is very much more extensive, occupying more than half of the forewing and a large portion of the hindwing; in *A. eumolphus* the blue on the hindwing is confined to the discoidal cell.

178. *ARRHOPALA GANESA*, Moore. (Plate A, Fig. 6, ♂.)

Two specimens from 5,000 feet in May. The Chin Hill race, which is almost deserving of a distinct name, differs from typical *A. ganesa* from the Himalayas in being quite without the dull creamy tint on the underside of the hindwing so characteristic of that species, and in consequence all the markings are much more prominent.

179. *ACESINA PARAGANESA*, de Nicéville.

A single male from 7,000 feet in April, quite typical.

180. CURETIS BULIS, Doubleday and Hewitson.

The form *malayica*, Moore, was common in the Upper Chindwin from April to June, and also at the foot of the hills ; also from Manipur.

181. ZEPHYRUS LETHA, n. sp. (Plate A, Fig. 7, ♂.)

HABITAT: North Chin Hills, Burma.

EXPANSE: ♂, 1.6 inches.

DESCRIPTION: MALE. UPPERSIDE, *both wings* rich metallic green, with a marginal black border. *Forewing* has the black border narrow, of even width throughout ; the apical half of the costal margin also very narrowly black. *Hindwing* with the costal margin broadly black, the black border to the outer margin of moderate width, twice as broad as in the forewing. *Cilia* white. *Tail* black, tipped with white. UNDERSIDE, *both wings* pale fawn-colour glossed with silvery. *Forewing* with an outer discal slightly curved white band, attenuated posteriorly, extending from the costa to the first median nervule, inwardly bordered with fuscous ; a broad submarginal fuscous band, anteriorly faint, terminating at the submedian nervure in two dark spots, narrowly margined throughout its entire length with white ; a marginal white line followed by a fine blackish anteciliary line ; the disco-cellular nervules faintly marked with fuscous. *Hindwing*, a broad white discal band from the costa to the first median nervule passing beyond the discoidal cell, inwardly margined with fuscous and continued to the abdominal margin in a broken V-shaped line ; a double row of submarginal white spots, outwardly concave, the outer row conspicuously, the inner row obsoletely ; followed by a black-centred yellow spot in the first median interspace, beyond which is a black spot at the extreme anal angle inwardly marked with yellow, which is continued narrowly up the abdominal margin ; a marginal white line, followed by an anteciliary blackish line ; the disco-cellular nervules faintly marked with fuscous. *Abdomen* dark, paler beneath ; *thorax* densely clothed with greenish-white and pure white hair above and below respectively.

Mr. de Nicéville has kindly compared the type with its nearest allies and writes to me as follows :

“Appears to be most closely allied to *Z. syla*, Kollar, and *Z. birupa*, Moore, from both of which the outer black band to the forewing on the upperside being half as wide will distinguish *Z. letha* ; the markings

of the underside also are entirely different to those of any other species described from the Indian region except *Z. ziba*, Hewitson, with which they agree somewhat closely, but the coloration of the upperside is entirely different, being in both sexes of that species dull blue. It is also closely allied to *Z. scintillans*, Leech, from Chang-yang in Central China, and has the apex of the forewing similarly acute, but differs in the less prominence of the orange markings on the underside of the hindwing. *Z. diamantina*, Oberthür, from Amurland and the Island of Askold, is another very closely allied species, and principally differs in the greater development of the orange coloration at the anal angle of the hindwing on the underside; that species is said by Leech to equal *Z. smaragdina*, Bremer."

Described from a single male taken near Tiddim in the North Chin Hills, Burma, in May. Tiddim is situated on an off-shoot of the Letha range at an elevation of about 5,000 feet. The type specimen is in Mr. de Nicéville's collection.

182. *ILERDA EPICLES*, Godart.

Very common in the Upper Chindwin and in the hills up to 5,500 feet from February to July; also from Manipur. As true *I. epicles* appears to be confined to Java, it is probable that its Indian representative will have to be known as *I. phœnicoparyphus*, Holland, described from Hainan Island off the coast of China.

183. *ILERDA ANDROCLES*, Doubleday and Hewitson.

Not uncommon from 3,500 to 6,500 feet during March, April and May.

184. *PRATAPA DEVA*, Moore.

A single female from the Upper Chindwin.

185. *APHNÆUS LOHITA*, Horsfield.

Common in the Upper Chindwin from March to May.

186. *APHNÆUS SCHISTACEA*, Moore.

Between November and February I obtained at Myingyan, Upper Burma, four males and two females of a species of *Aphnæus* which agrees perfectly with the description of *A. schistacea* as given in the "Butterflies of India." The male has the lower discal area of the hindwing glossed with brilliant blue, and the inner margin of the forewing below the first median nervule sprinkled with plumbeous-silvery scales; in the female almost the whole of the hindwing, and the forewing

rather more broadly than in the male are similarly plumbeous-silvery. On the forewing the male has a small discal orange patch which is very diffused in the female. The underside is very similar to that of *A. vulcanus* to which the species is certainly allied, though it is, I should say, quite distinct.

These Myingyan specimens therefore I consider to be typical *A. schistacea*; however, at Kalewa in the Upper Chindwin I obtained three males of a species which differed from the specimens above described in being without plumbeous scales on the forewing, the inner margin being shot with blue instead, the orange patch of the forewing being also better defined, and the markings of the underside rather different. I hesitate, however, to describe the species as new.

No ally of *A. vulcanus* has previously been recorded from east of Calcutta, as the *A. vulcanus* var. *maximus* of Elwes from the Karen Hills belongs to the *ictis* group of the genus, and is only remotely allied to *A. vulcanus*, from which it differs in the important character of having the subbasal band on the underside of the hindwing broken up into well-separated ring-spots instead of being continuous.

187. *TAJURIA ILLURGIS*, Hewitson.

A single female at 3,500 feet in June.

188. *TAJURIA JANGALA*, Horsfield.

Common at the foot of the hills from May to July.

189. *HYPOLYCÆNA ERYLUS*, Godart.

Common in the Upper Chindwin from March to May.

190. *CHLIARIA OTHONA*, Hewitson.

Many males and a single female from the Upper Chindwin and the foot of the hills from April to June.

191. *CHLIARIA KINA*, Hewitson.

A single male taken in company with *Cyaniris* on wet sand at the foot of the hills in May, and a single female taken in March on the top of the grassy ridge above Fort White at about 7,000 feet. Both sexes agree exactly with Doherty's detailed description quoted in "The Butterflies of India, &c.," and in neither is the discal band on the underside of the forewing continuous, so they cannot be considered to be *C. cachara*.

192. *ZELTUS ETOLUS*, Fabricius.

Common in the Upper Chindwin in May and June.

193. *CHERITRA FREJA*, Fabricius.

Common in the Upper Chindwin from March to May, and in the hills up to 3,500 feet.

194. *HORAGA SIKKIMA*, Moore.

A single female taken in the Upper Chindwin in May.

195. *CATAPECILMA ELEGANS*, Druce.

A single pair taken in the Upper Chindwin in March.

196. *LOXURA ATYMNUS*, Cramer.

Common in the Upper Chindwin and at the foot of the hills ; also from Manipur.

197. *LEHERA ERYX*, Linnæus.

A single specimen from the Upper Chindwin in April.

198. *DEUDORIX EPIJARBAS*, Moore.

A single male from 3,500 feet in the rains ; this species appears to be rare in Burma.

199. *ZINASPA TODARA*, Moore.

One male and four females from 3,500 feet in May and June. These specimens are inseparable from others from the Nilgiris, and there is no doubt that *Z. distorta*, de Nicéville, should sink as a synonym of *Z. todara*. The latter is supposed to differ in the male being without purple on the hindwing, and by the disc of the forewing in the female being blue instead of purple. I find, however, that in Nilgiri males there is precisely the same amount of purple on the hindwing as in Burmese ones, while the tone of the coloration of the upperside in both sexes varies considerably as noted by Mr. de Nicéville himself. The ground-colour of the underside varies from pale fawn to dark red-brown very much in the same way as does *Tajuria jangala* ; in both species the tone of the colouring depending on the season, those with paler undersides being found in the dry weather. The present species does not appear to be very rare in Burma, and I have taken it in the South Chin Hills, the Karen Hills, and at Rangoon.

200. *RAPALA BUXARIA*, de Nicéville.

Three females taken at 5,500 feet in May. These specimens may turn out to belong to *R. nissa*, Kollar, the females of which are almost identical with those of *R. buxaria*, while the males are abundantly distinct. Both *R. nissa* and *R. buxaria* occur in the Shan Hills.

201. RAPALA VARUNA, Horsfield, (ORSEIS, Hewitson).

Common in the Upper Chindwin in May and June.

202. RAPALA PETOSIRIS, Hewitson.

Common in the Upper Chindwin in April and May.

203. RAPALA JARBAS, Fabricius.

A single male in the Upper Chindwin in April.

204. RAPALA, sp.

Two males from the Upper Chindwin in March. This is the species I recorded in my Yaw list as *R. melampus*, Cramer. I do not, however, now consider it to be that species, and it appears to be intermediate between *R. jarbas* and *R. melampus*; on the upperside and in the general tone of the underside it agrees best with *R. jarbas*, but the anal lobe of the hindwing on the upperside is pale yellow as in *R. melampus*, and on the underside the subanal black spot is crowned with pale yellow and not with scarlet as in *R. jarbas*. The female (which I have from the Yaw district) agrees with the male on the underside, and on the upperside is precisely intermediate between *R. melampus* and *R. jarbas*, having a distinct reddish tinge, but not nearly to the same extent as in *R. melampus*. I, however, hesitate to name a species of this difficult genus without more material.

205. SINTHUSA, sp.

A single female taken in the Upper Chindwin in May. It may belong to either *S. nasaka* or *S. amba*; it certainly is not *S. chandrana*; it does not agree very well with a Himalayan female of *S. nasaka* in my collection, so is most probably *S. amba*, Kirby.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

206. DELIAS HIERTE, Hübner; local race, INDICA, Wallace.

Common in the Upper Chindwin in May; also obtained up to 6,500 feet in the hills.

207. DELIAS AGOSTINA, Hewitson.

One male at 7,000 feet in May, and a female at the foot of the hills in April.

208. DELIAS PYRAMUS, Wallace.

A single specimen from 3,500 feet in the rains.

209. *DELIAS AGLATA*, Linnæus.

Common in the Upper Chindwin in April and May ; also obtained at 3,500 feet in the rains.

210. *DELIAS ITHIELA*, Butler.

A single quite typical male from 3,500 feet in the rains. This is probably the southernmost limit of the range of this species. Though I treat *D. ithiela* as a distinct species, I think there is little doubt that it is only one of the many forms of *D. belladonna*, Fabricius.

211. *PRIONERIS THESTYLIS*, Doubleday.

A single specimen of the dry-season form *watsonii*, Hewitson, from the foot of the hills in March.

212. *HEBOMOIA GLAUCIPPE*, Linnæus.

Common in the Upper Chindwin.

213. *IXIAS PYRENE*, Linnæus.

A few specimens of the form *moulmeinensis*, and a few of typical *pyrene*. No *Ixias* was noticed above 3,500 feet.

214. *COLIAS EDUSINA*, Felder.

Captain Longe, R.E., obtained a few specimens in Manipur of the form of this genus which is identified in the British Museum as *C. edusina*.

215. *TERIAS HARINA*, Horsfield.

Fairly common in the Upper Chindwin during April and May.

216. *TERIAS HECABE*, Linnæus.

The dry-season form *excavata* occurred commonly in April, and the rainy-season form in May and June. Only noticed up to 3,500 feet.

217. *TERIAS LÆTA*, Boisduval.

A single specimen at 5,000 feet.

218. *LEPTOSIA XIPHLA*, Fabricius.

Common in the Upper Chindwin.

219. *PIERIS CANIDIA*, Sparrman.

Common at from 5,000 to 7,000 feet in April. A few specimens also obtained in the Upper Chindwin in April and May.

220. *PIERIS MELETE*, Ménétrières.

A single male at 5,000 feet in May.

221. *HUPHINA NERISSA*, Fabricius (*DAPHA*, Moore).

Exceedingly common in the Upper Chindwin and up to 2,000 feet in the hills, the dry-season form (typical, *H. dapha*) occurring in March,

and an intermediate seasonal form in April and May. Mr. de Nicéville informs me that *H. nerissa* is the oldest name for this species.

222. *HUPHINA NADINA*, Lucas.

Two males at 1,500 feet in March and April, both intermediate between the extremes of the seasonal forms ; and one male of the rainy-season form at 3,500 feet in September.

223. *APPIAS ZELMIRA*, Cramer.

Common in the Upper Chindwin ; the dry-season form in March and April and the rainy-season form and intermediate forms during May.

* 224. *APPIAS HIPPO*, Cramer.

Obtained in Manipur by Captain Longe. The *A. hippoides* of Moore cannot be kept distinct from typical *hippo*.

225. *APPIAS PAULINA*, Cramer.

A single specimen from the Upper Chindwin in May, and numerous specimens from 3,500 feet in the rains ; these latter are nearest to the form *darada*, Felder, but are quite inseparable from typical *paulina*. It seems probable that the present species should stand as *A. albina*, Boisduval, and that *A. paulina* should be confined to Ceylon, as Cramer's figure appears to represent the Ceylon *Appias* which has been named *galene* by Felder and *lankapura* by Moore.

* 226. *APPIAS LALAGE*, Doubleday.

Two males from 3,500 feet in July, and a female of the seasonal form which has been named *argyridina* by Butler from 5,000 feet in October.

227. *CATOPSILIA CATILLA*, Cramer.

228. *CATOPSILIA CROCALE*, Cramer.

Both occurred commonly up to 7,000 feet. Mr. de Nicéville considers the above to be dimorphic forms of one species ; in this he is probably correct, but I am not prepared to follow him at present without further proof.

229. *CATOPSILIA PYRANTHE*, Linnæus.

Common in the Upper Chindwin, not noticed above 2,000 feet in the hills.

230. *NEPHERONIA HIPPIA*, Fabricius.

Common in the Upper Chindwin and up to 3,500 feet in the hills.

* I do not see any good grounds for retaining the generic names *Catophaga* and *Hiposcritia* ; the species assigned to them grade imperceptibly into typical *Appias*.

231. *DERCAS VERHUELLII*, Van der Hoeven.

Two specimens from 3,500 feet in the rains.

† Subfamily PAPILIONINÆ.

232. *TEINOPALPUS IMPERIALIS*, Hope.

Several seen one day in May, flying round the highest peak (Kennedy Peak) in the Letba range, at an elevation of over 8,000 feet. As I was on the march at the time, I could not wait more than half-an-hour, during which time none came within reach, but there is no doubt that the species is correctly identified.

233. *TROIDES ÆACUS*, Felder.

A single male at 3,500 feet in the rains.

234. *PAPILIO* (Menelaides) *ARISTOLOCHILÆ*, Fabricius.

Common in the Upper Chindwin, and in the hills up to 3,500 feet.

235. *PAPILIO* (Byasa) *POLLA*, de Nicéville.

A single female at 5,000 feet in the rains.

236. *PAPILIO* (Byasa) *PHILOXENUS*, Gray.

Common at 5,000 feet from May throughout the rains; a single specimen of the form *dasarada*, Moore, was obtained at the same season and elevation.

237. *PAPILIO MACHAON*, Linnæus.

The geographical race *sikkimensis*, Moore, occurs commonly at and above 6,000 feet during March and April.

238. *PAPILIO* (Orpheides) *DEMOLEUS*, Linnæus.

Common, but not noticed above 3,000 feet.

239. *PAPILIO* (Charus) *HELENUS*, Linnæus.

Not uncommon in the hills up to 4,000 feet.

240. *PAPILIO* (Charus) *CHAON*, Westwood.

Occurred rarely in company with the preceding.

241. *PAPILIO* (Iliades) *MEMNON*, Linnæus.

The Indian race *agenor*, Linnæus, occurred fairly commonly at the foot of the hills.

242. *PAPILIO* (Panosmiopsis) *RHETENOR*, Westwood.

Captain Longe, R.E., obtained a single male at 2,000 feet on the Manipur river in February, and Surgeon-Captain Graves captured a second male at 5,000 feet in the rains.

† In this subfamily I have followed Mr. W. Rothschild's recent revision of the genus *Papilio* in "Novitates Zoologicae," vol. ii, 1895.

243. *PAPILIO* (Laertias) *POLYTES*, Linnæus.

Common, but not noticed above 3,500 feet.

244. *PAPILIO* (Tamera) *CASTOR*, Westwood.

A single quite typical female from the Upper Chindwin in April.

245. *PAPILIO* (Chilasa) *CLYTIA*, Linnæus.

Common in the hills and the Upper Chindwin from March to June, but not found above 3,500 feet. All the specimens obtained belong to the geographical race *panope*, Linnæus, and include both the typical form of that race and also the corresponding *dissimilis* form. Also obtained from Manipur.

246. *PAPILIO* (Sarbaria) *POLYCTOR*, Boisduval.

Captain Longe obtained a rather small male of the race *ganesa*, Doubleday, on the Manipur river at 2,000 feet in February.

247. *PAPILIO* (Achillides) *PARIS*, Linnæus.

Common at the foot of the hills in March and April and up to 3,500 feet in the rains.

248. *PAPILIO* (Pathysa) *MANDARINUS*, Oberthür.

A single not quite typical male of the local race *paphus*, de Nicéville, was obtained at 7,000 feet in April. Several other specimens were noticed at the same time flying round the tops of trees in copses.

249. *PAPILIO* (Pathysa) *ANTIPHATES*, Cramer.

The Indian race *alcibiades*, Fabricius, was not uncommon at the foot of the hills from March to May.

250. *PAPILIO* (Pathysa) *NOMIUS*, Esper.

The eastern race *swinhoei*, Moore, was common in the Upper Chindwin from March to May, and Captain Longe also obtained it commonly at 2,000 feet on the Manipur river in February.

251. *PAPILIO* (Zetides) *EURYPYLUS*, Linnæus.

The race *axion*, Felder, was not uncommon at the foot of the hills in May.

252. *PAPILIO* (Zetides) *BATHYCLES*, Zinken-Sommer.

Three specimens of the race *chiron*, Wallace, were obtained at the foot of the hills in May.

253. *PAPILIO* (Zetides) *AGAMEMNON*, Linnæus.

A single specimen was obtained at 3,500 feet in the rains.

254. *PAPILIO* (Dalchinia) *SARPEDON*, Linnæus.

Common at the foot of the hills from March to May.

255. *ARMANDIA LIDDERDALII*, Atkinson.

Surgeon-Captain Graves obtained a single specimen at Fort White at 7,000 feet in September, and I have subsequently obtained it from a similar elevation in the South Chin Hills taken in the same month. This species is single-brooded.

Family *HESPERIIDÆ*.Subfamily *HESPERINÆ*.256. *CELÆNORRHINUS PERO*, de Nicéville.

Two specimens from 3,500 feet in the rains.

257. *CELÆNORRHINUS LEUCOCERA*, Kollar.258. *CELÆNORRHINUS AURIVITTATA*, Moore.

Both the above were common in the Upper Chindwin from March to May.

259. *SARANGESA DASAHARA*, Moore.

Common everywhere up to 3,500 feet from March to June.

260. *COLADENIA DAN*, Fabricius.

Similarly distributed to the preceding.

261. *DAIMIO BHAGAVA*, Moore.

Common in the Upper Chindwin and in the hills up to 1,500 feet in February and March.

262. *DAIMIO NARADA*, Moore.

Two specimens in the Upper Chindwin and one at 1,500 feet in March.

263. *TAGIADES ATTICUS*, Fabricius.

A single pair from the Upper Chindwin in April and May. In this species the male has a single transparent spot in the cell of the forewing, and the female two spots. *T. menaka* differs typically in the markings on the upperside of the hindwing, but these are of a very variable nature.

264. *TAGIADES OBSCURUS*, Mabille.

Three specimens in the Upper Chindwin in March and May. The only Burmese specimens I have seen. They do not differ from South Indian specimens in my collection.

265. *CTENOPTILUM VASAVA*, Moore.

Two males only taken at 1,500 feet in March.

266. *CTENOPTILUM MULTIGUTTATA*, de Nicéville.

Very common at from 1,500 to 2,000 feet in March. A very distinct species. All specimens of this and the preceding were taken

either when at rest on wet sand, on which they settle with their wings wide outstretched, or else buzzing rapidly backwards and forwards near the hill-paths four or five feet above the ground and looking more like an *Aphnæus* than a skipper.

267. ODONTOPTILUM ANGULATA, Felder.

Taken in company with the preceding and again in July.

268. CAPRONA ALIDA, de Nicéville.

Two males in the Upper Chindwin in March.

269. CAPRONA SYRICHTHUS, Felder.

Two males at 1,500 feet in May. Females of this species are extremely rare. There is a single specimen in the Phayre Museum, Rangoon, and Mr. de Nicéville informs me he has one from Moulmein.

270. CAPRONA ELWESII, n. sp.

Three males at 1,500 feet and one in the Upper Chindwin, all taken in May.

I propose this name for the insect figured by Mr. Elwes in the Proc. Zool. Soc. Lond., 1892, Pl. xliii, fig. 2, as "*C. syrighthus*, var." There seems to be no doubt that this is quite a distinct species, the differences between it and *C. syrighthus*, though slight, are absolutely constant, and the two species show no tendency to vary towards one another. *C. elwesii* is much the smaller. On the *upperside* of the *forewing* the basal spot in the submedian interspace is divided into two; on the *upperside* of the *hindwing* the basal spot in the discoidal cell is small and inconspicuous, while of the four discal spots which are constantly present in true *C. syrighthus* only the one closing the cell is present in *C. elwesii*; the *underside* of the *forewing* is also much more strongly suffused with grey in the latter. Both species agree in habits with one another and with the species of *Ctenoptilum* referred to above. Mr. Elwes records *C. syrighthus* from Bhamo, the Shan Hills, and Java, and *C. elwesii*, from Bhamo. I have obtained males of *C. elwesii* in both the North and South Chin Hills, in the Upper Chindwin District, and at Thayetmyo, in Lower Burma; of *C. syrighthus* I have only met with the two males recorded above.

Mr. de Nicéville informs me that his series of *C. syrighthus* are quite constant and average a third larger than *C. elwesii*, and in the separation of which he concurs.

271. *HESPERIA GALBA*, Fabricius.

A single specimen at 5,500 feet. I quite erroneously recorded this species from the South Chin Hills under the name *H. zebra*, Butler. This latter species which, I have no doubt, is quite distinct, is readily separable by the obsolete spotting of the upperside; the regular banding of the underside of the hindwing is not such a good point of separation, since in true *H. galba* the bands, especially the medial one, are fairly sharply defined. Mr. de Nicéville appears to find some difficulty in separating *H. evanidus* from *H. galba*, but I have not met with the same difficulty in examining the long series of both species in the British Museum; the former has the underside chequered or spotted and not banded, and is to my mind quite distinct. *H. geron*, *mihi*, has a very similar chequered underside to *H. evanidus*.

Subfamily PAMPHILINÆ.

272. *PAMPHILA GEMMATA*, Leech.

A fairly common species on the high ridges near Fort White; altogether twelve specimens were obtained during March and April at from 6,500 to 7,500 feet.

M. Oberthür has recently (*Études d'Entomologie*, vol. xx, p. 40, (1896)), erected the genus *Aubertia* for this species and its allies on the grounds that, like *Hesperia*, *Noctua* and *Agrotis*, the genus *Pamphila* is a receptacle for all species the generic location of which is doubtful. While, however, I fully agree with M. Oberthür that *Pamphila* is used as a waste-paper basket, yet in this instance I think the genus has been rightly employed for *gemma*, and I am unable to say how *Aubertia* differs from *Pamphila*, nor has M. Oberthür diagnosed the genus, and till he does so the separation of the genus has little value. M. Oberthür also tries to make out that his name *demea* should have priority over *gemma*, Leech, on the grounds that the latter author did not figure the species and states that "It is quite impossible to identify Lepidoptera with accuracy without a good figure, and descriptions are quite useless unless amplified by a figure." This argument, it is perhaps needless to say, is quite inadequate to upset undisputed priority of publication. M. Oberthür also claims that Mr. Leech took an unfair advantage of him in the manner in which he published his descriptions of the present and some other species, but this is a

question which only affects M. Oberthür and Mr. Leech, and does not in any way nullify the actual priority of the nomenclature.

273. *OCHUS SUBVITTATUS*, Moore.

Four specimens at 3,500 feet in June and July. Of these specimens one has two subapical yellow spots, two have a few subapical yellow scales, which can hardly be termed spots, and the fourth is immaculate.

274. *AMPITTIA MARO*, Fabricius.

A single female in the Upper Chindwin in March.

275. *TARACTROCERA ATROPUNCTATA*, n. sp. (Plate A, Fig. 9, ♂.)

HABITAT: Kalewa, Upper Chindwin District, Burma; Hong-Kong.

EXPANSE: ♂, ♀, 1.1 inch.

DESCRIPTION: MALE. UPPERSIDE, *both wings* dark brown. *Forewing* with the following yellow spots:—one in the discoidal cell, with a short streak above it between the subcostal nervules; three subapical, conjoined, the upper one small, the lower two larger and elongated; two conjoined below and exterior to these, and two conjoined beyond and below the discoidal cell. *Hindwing* with a yellow spot in the discoidal cell, and a discal series of three or four rather indistinct yellow spots—all these spots small. UNDERSIDE, *forewing* dark brown, the costa as far as the end of the discoidal cell broadly yellow, the outer margin also broadly yellow from the apex to about the first median branch, the yellow spots as on the upperside. *Hindwing* yellow, inner margin broadly fuscous, a black spot at the base of the discoidal cell, a similar one above the cell; a large black spot at the end of the cell, extending from the subcostal bifurcation to the fuscous inner margin, all the veins crossing it yellow, thus dividing it into internervular spots; and a submarginal row of six black spots, of which the upper two and the fourth and fifth are large and elongated; *both wings* with an anteciliary narrow black line. *Cilia* above and below greyish-yellow. *Hindwing* with a fringe of long black hairs attached to the basal half of the costal margin. FEMALE differs only in having the markings of the upperside slightly more prominent, and in wanting the fringe of hair on the costa of the hindwing. BOTH SEXES, *fore-tibiae*, epiphysis minute, *mid-tibiae* with a single pair of spurs, *hind-tibiae* with two pairs of spurs.

Nearest to *T. ceramas*, Hewitson, with which the markings of the upperside agree fairly well; the black spotted underside to the hindwing is, however, very distinctive.

Flight weak, settling on grass-stems with the wings closed above the back, and in no way differing in its habits from *T. mævius* or *T. ceramas*.

Described from four males and one female obtained at Kalewa on the Chindwin river, Burma, in March, May and June. In Mr. de Nicéville's collection is a specimen from Hong-Kong, so it is probably found across Southern China.

I take this opportunity to describe and figure a species of *Taractrocera* not previously recorded from within Indian limits.

TARACTROCERA ZICLEA, Plötz. (Plate A, Fig. 8, ♂.)

HABITAT: Philippines (Plötz: *Semper*): Burma.

EXPANSE: ♂, ♀, .9 to 1.0 inch.

DESCRIPTION: MALE. UPPERSIDE, *both wings* black with golden-yellow markings. *Forewing* with a broad yellow costal streak from the base reaching to beyond half the length of the wing, filling the entire discoidal cell with the exception of an indistinct dark streak from the base of the cell which is overlaid and almost concealed by the yellow scaling; the base of the wing posterior to the median nervure as far as the first median nervule is similarly dark, overlaid with yellow scales; three conjoined subapical spots, the veins crossing them concolorous; two conjoined spots below and nearer the outer margin than the subapical spots; and three yellow spots, outwardly indented, reaching from the third median nervule to the submedian nervure, the veins dividing them dusted with black; the inner margin dark, overlaid with yellow scales as far as the submarginal yellow band. *Cilia* fuscous, yellowish at the outer angle. *Hindwing*, with a subbasal yellow spot and a yellow median band extending from the second subcostal nervule to the submedian nervure, the latter yellow throughout its length. *Cilia* golden-yellow. UNDERSIDE, *both wings* with a conspicuous narrow anteciliary black line. *Forewing* with the apical two-thirds of the outer margin yellow, other markings as on the upperside, except that the portions of the wing which are overlaid with yellow scales on the upperside are black on the underside. *Hindwing*, as on the upperside, except that the dark portions are overlaid with yellow scales. FEMALE.

UPPERSIDE similarly marked to the male except that on the *forewing* the costa above the discoidal cell is dark and the overlying yellow scales at the base and along the inner margin are obsolescent, so that the dark markings show up more prominently. UNDERSIDE as in the male, but the dark markings on the hindwing less concealed by yellow scales. *Abdomen* dark above, yellow beneath. ANTENNÆ, *shaft* ringed with black and yellow, *club* black above, yellow beneath, *tip* dark. LEGS, yellow, almost naked, hind-tibiæ with two pair of spurs, fore-tibiæ with the usual epiphysis. No secondary sexual characters on the wings or legs. Both sexes have a tuft of black hairs at the extreme base of the costa of the hindwing; this tuft is perhaps slightly more developed in the male.

This species belongs to the group which contains *T. papyria*, Boisduval; *T. nigrolimbata*, Snellen; *T. flavovittata*, Latreille, and *T. flavoides*, Leech, all of which much resemble species of *Padarona* in markings. From *T. papyria* the present species differs in wanting the sexual brand on the upperside of the forewing, from *T. nigrolimbata* in the much smaller extent of the yellow markings of the upperside, from *T. flavovittatus* in the entirely different markings of both upper- and underside, lastly from *T. flavoides* which is known to me only by the figure and which appears its nearest ally, the present species differs in the much more pronounced banding of the underside of the hindwing.

Described from five males and one female taken at Thayetmyo in September, and two females taken at Myingyan in November; I have also previously taken the species in the Yaw District and recorded it as *Padraona nigrolimbatus*, and have lately seen a specimen from Moulemein, which is in Mr. de Nicéville's collection. The species shows little variation, except that the yellow band on the forewing is slightly broader in some specimens than in others, and that the uppermost spot in the discal band on the hindwing is occasionally minute or altogether wanting.

I had described this species as new, but Mr. de Nicéville pointed out to me that in his opinion my type specimens belonged to "*Thymelicus*" *ziclea*, Plötz, and sent me some Philippine specimens to compare, and I have no doubt as to the identity of the Burma and Philippine examples.

276. *ASTICTOPTERUS KADA*, Swinhoe.

Ten specimens taken in the Upper Chindwin from March to May. Of these specimens, eight have three largish transparent subapical white spots on the forewing, one has the uppermost spot almost invisible, and the tenth has only the two lower spots present, and these very minute. I very much doubt if this is a distinct species from *A. olivascens*, Moore.

277. *SANCUS PULLIGO*, Mabille.

Very common in the Upper Chindwin from March to June.

278. *SUASTUS GREMIUS*, Fabricius.

Upper Chindwin, April; not common.

279. *SUASTUS ADITUS*, Moore.

Fairly common in the Upper Chindwin during March and April.

280. *IAMBRIX SALSALA*, Moore.

Common everywhere up to 1,500 feet.

281. *SEBASTONYMA DOLOPIA*, Hewitson.

Two specimens in May, one at the foot of the hills and the other at Kalewa in the Upper Chindwin. A rare species in Burma.

282. *ZOGRAPHETUS SATWA*, de Nicéville.

Six specimens in the Upper Chindwin from March to May.

283. *ZOGRAPHETUS OGYGIA*, Hewitson.

Four specimens in the Upper Chindwin from March to May. This species varies considerably in the number of transparent spots on the upperside of the forewing.

284. *ZOGRAPHETUS CEPHALA*, Hewitson.

Common in the Upper Chindwin from March to May. Colonel Swinhoe has recently described the male of *Z. cephal*a as a new species under the name *isota*. The two sexes, besides differing slightly in the size of the transparent spots, differ considerably in the marking of the underside of the hindwing, which in the male is of a clear greenish-yellow without marking, but in the female is suffused with rufous-brown between the transparent spots and the outer margin. This reddish suffusion is very variable in extent, but in the numerous specimens which I have seen is invariably more or less present in the females, and is never traceable in the males. Hewitson's type is a female in which the suffusion is unusually large in extent. There can

be absolutely no question that the variation is merely sexual, so *isota* should be sunk as a synonym.

285. HYAROTIS ADRASTUS, Cramer.

Upper Chindwin, May; not common.

286. ARNETTA SUBTESTACEA, Moore.

A single specimen at the foot of the hills and two in the Upper Chindwin all in March. I am unable to say how *A. khasiana* differs from the present species, and think it is identical with it; there is no doubt that *A. atkinsonii* is its rainy-season form.

287. MATAPA ARIA, Moore.

Common in the Upper Chindwin from March to May, not noticed in the hills.

288. MATAPA DRUNA, Moore.

Similarly distributed, but not as common as the preceding.

289. GANGARA THYRSIS, Fabricius.

A single specimen from the Upper Chindwin in May, and a second from 3,500 feet in the rains.

290. UDASPES FOLUS, Moore.

Common in the Upper Chindwin.

291. NOTOCRYPTA RESTRICTA, Moore.

A single specimen from 3,500 feet in the rains.

292. CUPITHA PURREEA, Moore.

Two males taken in the Upper Chindwin in March and May. One typical *tympanifera*, the other transitional to *purreea*.

293. AUGIADES BRAHMA, Moore.

Eleven males at from 5,500 to 7,000 feet in March, April and May. These specimens differ from typical ones from Mussooree in being slightly smaller and darker. They are otherwise quite inseparable from *A. brahma*, and the above slight differences are not sufficient to warrant their being treated even as a local race. One would have expected to find the Khasi Hill species, *A. siva*, in the Chin Hills and not the Himalayan *A. brahma*; my specimens are, however, distinctly nearer to *brahma* than to *siva*.

294. TELICOTA AUGIAS, Linnæus.

A single male from the Upper Chindwin in May.

295. TELICOTA BAMBUSÆ, Moore.

A single female from the Upper Chindwin in March.

296. *PADRAONA DARA*, Kollar.

A single male at the foot of the hills in April.

297. *PADRAONA MÆSOIDES*, Butler.

Three males and one female in the Upper Chindwin between March and May.

298. *PADRAONA PSEUDOMÆSA*, Moore.

A single male in the Upper Chindwin in April. The above three *Padraonas* may be wrongly identified, but I think without doubt belong to three distinct species. I also obtained three males and one female of a fourth species, which appears to be undescribed.

299. *PADRAONA GOLA*, Moore.

Not uncommon in the Upper Chindwin from March to May. This species, as well as the South Indian *P. goloides*, is without the male mark found in the other species of the genus, and also differs from them slightly in neururation.

300. *HALPE MOOREI*, Watson.

Common in the Upper Chindwin during March and April.

301. *HALPE CERATA*, Hewitson.

A single specimen seen at 1,500 feet.

302. *HALPE MASONI*, Moore.

A single male in the Upper Chindwin in April.

303. *ITON SEMAMORA*, Moore.

Upper Chindwin, in April and May ; fairly common.

304. *BAORIS OCEIA*, Hewitson.

Common in the Upper Chindwin and up to 1,500 feet from March to May and, as usual, very variable. A form of this species has recently* been described by Colonel Swinhoe under the name *B. sikkima*. The two sexes which are taken as representing *B. sikkima* do not however even belong to the same form, as the male has the full complement of eight spots, while the female wants the two spots in the discoidal cell of the forewing ; no reason is given for not taking two sexes of the same form, though females with two spots in the cell are as common in Sikkim as those without them. While describing *B. sikkima*, Colonel Swinhoe tries to cast doubt on the authenticity of the specimen in the Hewitson collection which stands as the type of *B. oceia*, and in a subsequent paper on the Khasia Hill butterflies

* Ann. and Mag. of Nat. Hist., May, 1890, p. 363.

makes the following statement :—"Hewitson described a Philippine insect as *oceia*, and subsequently put every Indian Hesperid in his collection with the long brush of hairs on the upperside of the hindwing over his Philippine insect."

This statement, as it stands, is absolutely correct, but is hardly calculated to increase Colonel Swinhoe's reputation for accuracy, since by an oversight he has overlooked the fact that in the whole Hewitson collection there is not a single Indian Hesperid with a brush on the upperside of the hindwing, the only specimen being the one placed above the label "*oceia*," which is ticketed "Philippines," and there is no shadow of doubt as to its being the actual specimen described by Hewitson. In describing his *B. sikkima*, Colonel Swinhoe makes no attempt to point out how it differs from *B. oceia*, and I may add that I have compared Burmese specimens with the Hewitson type in the presence of Colonel Swinhoe and have asked him to point out any differences between them, which he has confessed himself quite unable to do, but has maintained that, being a Philippine insect, *B. oceia* MUST be distinct from anything found in India, the value of which argument is shown by the fact that of 86 *Hesperidae* recorded from the Philippines by Semper, no less than 37 have also been recorded from within Indian limits.

305. BAORIS (Parnara) AUSTENI, Moore.

Common in the Upper Chindwin from March to May. This species is very fairly constant, but the subapical spots are frequently reduced from three to two, and the upper of the two spots in the discoidal cell is frequently very minute ; but I have seen no specimen in which it has been actually wanting. It is rather difficult to discriminate between this species and females of *B. oceia*, but the tone of the underside of the hindwing appears to be a safe guide, as *B. austeni* always has a reddish tinge, while *B. oceia* is more slatey.

306. BAORIS (Parnara) CONJUNCTA, Herrich-Schäffer (=NAROOA, Moore.)

A few specimens from the Upper Chindwin in April.

307. BAORIS (Parnara) TOONA, Moore.

Common in the Upper Chindwin and up to 1,500 feet from March to May.

308. BAORIS (Parnara) ELTOLA, Hewitson.

Two specimens—one from 5,000 feet in May and one from 1,500 feet in June.

309. BAORIS (Parnara) BEVANI, Moore.

Common at Kalewa and in the hills up to 5,500 feet during March and April. *B. colaca* was not obtained, but probably occurs.

310. BAORIS (Parnara) BADA, Moore.

A single specimen in the Upper Chindwin in March.

311. BAORIS (Chapra) MATHIAS, Fabricius.

A single male in the Upper Chindwin in April.

312. ISMENE ATAPHUS, Watson.

A single male in the Upper Chindwin in March.

313. ISMENE HARISA, Moore.

A single male in the Upper Chindwin in May.

314. ISMENE AMARA, Moore.

A single male in the Upper Chindwin in May.

315. ISMENE MAHINTHA, Moore.

Three males and one female in the Upper Chindwin in April and May.

316. HASORA BADRA, Moore.

Not uncommon in the Upper Chindwin from April to June.

317. HASORA CHABRONA, Plötz.

Two males taken in the Upper Chindwin in May.

318. HASORA CHROMUS, Cramer.

A single female at 3,500 feet in May.

319. HASORA ALEXIS, Fabricius.

A single female at 3,500 feet in June. I am inclined to consider this distinct from the preceding, as not only do they differ from one another in the breadth of the transverse band on the underside of the hindwing, but *H. alexis* is much more strongly glossed with purple on the underside. I have lately met with *H. chromus* in considerable numbers at Bangalore, and have found it very constant in the markings on the underside, though the transparent spots of the female are very variable.

320. BADAMIA EXCLAMATIONIS, Fabricius.

A single male at 1,500 feet in April. The male of this species has a tuft consisting of a few long straggling hairs attached to the proximal

end of the hind-tibiæ. This tuft is very lightly attached and easily rubbed off, and I overlooked it when revising the genera of the family.

As the butterflies of North-Western Burma, of which little was known a few years ago, have now been fairly well worked, a few remarks on their distribution would not be out of place. Under the head North-Western Burma we may include the administrative districts of the Upper Chindwin and Yaw, the North and South Chin Hills, and also the faunistically inseparable regions of the Lushai Hills, the Chittagong Hill Tracts and Manipur ; strictly the Naga Hills should also be included, but they have not been taken into consideration in the following remarks pending their further exploration.

Our knowledge of the district under consideration is derived almost entirely from the following five papers to which may be added a few records from "The Butterflies of India, Burma, and Ceylon," and other sources :—

- (1) A Collection of Lepidoptera made at Manipur and on the Borders of Assam by Dr. George Watt. Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. xvi, p. 298 (1885), in which 114 species are enumerated.
- (2) List of Chin-Lushai Butterflies, de Nicéville, Journ. Bomb. Nat. Hist. Soc., vol. v, p. 295 (1890), in which 84 species are enumerated.
- (3) A second list of Chin-Lushai Butterflies, de Nicéville, *id.*, *id.*, p. 383, in which 102 species are enumerated.
- (4) Notes on a Collection of Butterflies made in the Chin-Lushai Expedition of 1889-90, Watson, *id.*, *id.*, vol. vi, 1891, in which 276 species are enumerated.
- (5) The present paper which enumerates 320 species.

It will be seen on reference to the above papers that the collections recorded have been made almost entirely in the dry-season and along beaten tracks, and there is no doubt that, when the country is more opened up and accessible, many additional species will be added to the number already recorded.

After excluding bad species and doubtful records, the total number of species recorded from the district under consideration amounts to 447, which are distributed among 172 genera. These latter are mostly wide-spread throughout the Oriental region and do not call for

remark, with the exception of the following which here reach one extreme of their range :—

Anadebis, *Callerebia*, *Zipætes*, *Dilipa*, *Orthomiella*, *Phengaris*, *Zephyrus*, *Pieris*, *Colias*, *Armandia*, *Teinopalpus*, *Pamphila*, *Sebastonyma*, and *Angiades* do not occur to the south of the district, though nearly all of them have been or almost certainly will be found to occur at a similar latitude in the hills on the eastern frontier of Burma.

On the other hand *Melanocyma*, *Prothoë*, *Taxila*, *Paragerydus*, *Drupadia*, *Eoöxylides*, *Drina* and *Onryza* have here reached their northern limit, and are for the most part typical of the Malayan subregion.

The subgenus *Myrtilus* of *Mycalesis* is, as far as is known at present, peculiar to the district.

The general nature of the region under consideration is mountainous, with the exception of the Upper Chindwin and Yaw districts, and the butterflies may be divided into three fairly well-marked groups :—

- (1) Species peculiar to low elevations.
- (2) Species peculiar to high elevations.
- (3) Species common to both.

The first group, which consists of species which are only rarely found above 2,000 feet, contains 288 species, of which six are peculiar to this district and four occur also in Eastern Burma, but do not occur to the north or the south, of these ten, eight are distinctly Malayan in their affinities, and the other two are Indian ; 116 species are wide-spread, and are found from Tenasserim to the Western Himalayas, many ranging also to peninsular India on the one hand and to the Malay Peninsula on the other. Of the remainder, 87 occur throughout the whole of Burma and have been also recorded from Assam, and of these 68 also range to the Eastern Himalayas ; 32 species do not occur to the south of the present district though found at the same latitude in Eastern Burma ; all these 32 species have also been recorded from Assam, and most of them from the Eastern Himalayas, while seven range as far as Southern India. The remaining 43 species of this group are peculiarly Burmese and Malayan, and are found to the south as far as Tenasserim, and in many cases as far as the Malay Peninsula ; none of them, however, occur to the north of the present district.

This group is, therefore, distinctly Burmese in its distribution, and if we ignore the wide-spread species from which it is difficult to draw conclusions, we find that one-third of the remainder are typical Burmese species and do not range to the north of that country, that about one-sixth are typical North-East Indian species, which within Burmese limits only occur in the extreme north; while the remaining species which amount to half the total number are typical equally of Burma and of North-East India.

The second group, under which are included the species which affect high elevations and which are only very rarely found below 4,000 feet, contains 92 species. These are for the most part Himalayan—at least 74 species being found in the Eastern Himalayas, of which 28 extend to the Western Himalayas and a few to the hill ranges of peninsular India; in addition to the above four species—*Arrhopala dodonæa*, *A. ganesa*, *Celaenorrhinus pero*, and *Augiades brahma*—are common to North-West Burma and the Western Himalayas, but have not been found in the intermediate hill-ranges. Six species are peculiar to the district, and a seventh is only found elsewhere in Northern Burma; of these seven, four are Himalayan and three Malayan in their affinities. Twenty-nine species extend as far south as Lower Burma and Tenasserim, and 63 are not found to the south of the present district, though most of these latter are found in the hill ranges of Eastern and Northern Burma.

So it will be seen that the Malayan element is almost entirely absent from this group; in fact, of the whole 92 species only seven have been recorded from the Malay Peninsula.

The third group, which includes species which are found at all elevations from the terai to the summit of the hills, contains 67 species. These, as might be expected from adaptability of flight, have almost, without exception, a very wide range; 64 are found throughout Burma as far south as Tenasserim, and of these two only do not range further to the north, while of the remainder 42 are of universal distribution throughout the hills and plains of India; 4 occur as far west as the Western Himalayas, but are not found in peninsular India, while the remaining 16 occur throughout Assam and Sikkim, but not further west. The remaining three species of this group are peculiar to North-East India and do not occur to the south of the present district.

Owing to the wide range of the species of this group, not much clue to their affinities can be given.

To sum up, it may be concluded that the butterflies found at low elevations are chiefly Burmese in their characteristics with a slight North-East Indian strain, while those from high elevations are much more Himalayan, and their Burmese affinities are very little marked.

EXPLANATION OF PLATE A.

- Fig. 1. *Mycalesis (Virapa) adamsonii*, n. sp., ♀, p. 640.
,, 2. *Ypthima sakra*, Moore, ♂ (local race), p. 645.
,, 3. *Ypthima cerealis*, n. sp., ♂ (dry-season form), p. 646.
,, 4. *Ypthima cerealis*, n. sp., ♂ (rainy-season form), p. 646.
,, 5. *Ypthima iarba*, de Nicéville, ♂, p. 651.
,, 6. *Arrhopala ganesa*, Moore, ♂ (local race), p. 663.
,, 7. *Zephyrus letho*, n. sp., ♂, p. 664.
,, 8. *Taractrocera ziclea*, Plötz, ♂, p. 677.
,, 9. *Taractrocera atropunctata*, n. sp., ♂, p. 676.

MISCELLANEOUS NOTES.

No. I.—NOTES ON THE INDIAN BEAR (*MELURSUS URSINUS*).

BY REGINALD GILBERT.

(With a Plate.)

This bear which is still to be found all over the Indian Peninsula is, I fear, gradually disappearing. Twenty years ago it was very common throughout the Bombay Presidency, and I know many jungles and districts, in which I have formally shot many, where they are now rarely or never to be found. In wild and rocky districts, far away from the line of rail, no doubt they exist in numbers, and frequent the same jungles year after year, but still they are gradually being reduced.

To see a bear lolluping along, when disturbed, is a sight which always causes me amusement, but with all its apparent clumsiness and awkwardness, it can get over rough ground as quick as most animals, and, when wounded, will fight for its life often with great ferocity. It is not an animal which causes much injury to the natives or their cattle or crops, but occasionally it takes to man-killing, or man-mauling, for no apparent reason, and then, of course, it becomes the terror of its particular district. I have only known of one man-killer. It was a she-bear with three grown cubs in the Dharampur State, and killed a man close to a camp occupied by Mr. E. L. Barton and myself when we were on a shooting trip in that State. She laid up in a jungle close by, after committing this ill-deed, and we had no trouble in killing her. I wrote an account to our Magazine about this bear,* so it is unnecessary to say here any more about her. When wounded, however, there is no doubt the bear is very ferocious, and inflicts the most fearful wounds with its claws on its victims.

My first introduction to the bear was on a shooting trip I took alone when first I came to this country. I set out from Lanowlee and after marching 25 miles south along the ghâts, I got "khubber" of bear, and immediately sent men out for the purpose of watching from the hill-tops in the early morning, when the bears returned to lay up for the day in the hills. The men marked down a bear in thick jungle on the side of the hill, and they placed other men all round to watch the place till I arrived. When I arrived, however, and before the beat was organised, they made so much noise, talking and shouting to one another, that the bear woke up and made off. He came, however, broadside to me, and presented a shot at about 60 yards, but much to my vexation, although I wounded him, he got clean away, and left me under the impression that he was the most cowardly of animals—an impression which was rudely disturbed next day. The next night I sent out men again to watch the hills, and, strange to say, they marked down

* *Vide* No. 2, Vol. VI, page 276, of this Journal—Ed.



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THE INDIAN SLOTH BEAR.

Melursus ursinus.

another bear in exactly the same spot next morning. Again the beaters talked too much before the beat commenced and disturbed the bear. This time, however, he ran much nearer to me, and I lamed him badly. He went off into thick under-growth jungle and, with a few plucky hill-men, I tracked him into it easily by his blood. In my "griffenish" innocence I had no idea that he was likely to charge, and I tracked him into this thick jungle without any sense of fear. I soon came on to him, and he came at me with a terrible rush. I fired right and left into him very quickly and bolted back. Luckily for me, my large pith hat was knocked off by a bush, in running back, and the bear stopped at the hat which he clawed and bit into pulp. This gave me time to load up and face the foe again. After this he ran into still thicker jungle and I approached him with greater caution and respect, but I had to do it without a hat in a hot sun. However, I tied something round my head and went in at him again. I received another charge, and gave the bear two barrels as before at close quarters, and rushed back, but the bear did not follow far. I got the bear after a very long fight, but I have had great respect for his bravery ever since.

The only successful way of getting bears is to go into the jungles they frequent, and get natives to watch from the top of hills in the early morning. Natives are very quick at marking them down, and an incentive in the promise of a few rupees for each bear marked down, results often in good sport. I remember once in the Nizam's Dominions going after some tigers which had been killing cattle there. A reward of five rupees brought us the news that a bear had been marked down not far from camp, and we were able to go out after it before breakfast and were home in good time to go after the tigers. We had no time to get beaters, and we simply walked up to the bush in which it had been marked down. It had gone into heavy sleep before we aroused it and when disturbed, it walked off quite leisurely and appeared to be dazed. We were quite close and, I feel sure, we despatched it without its ever having seen us. On other occasions, when on shooting trips, I have myself gone out into the hills before daylight to watch for returning bears. I do not remember ever being successful myself on these occasions, although frequently my companions have bagged their bears in this way.

General P. Symons lately told me that he was out shooting many years ago with some companions in the Madras Presidency. At one of their camps they were told there was a bear's stronghold in the neighbourhood to which the bears returned every morning over some open country which was ridable. Early the next morning the whole party went out on their horses with spears, and they met no less than eleven bears returning together, of which nine were speared and killed by the party. This, I think, must be the biggest bag on record, and I regret an accurate account of this day's sport has never been published.

Colonel Kenneth Mackenzie also told me of an extraordinary scene he witnessed once in the Berars. One night he sat up over a buffalo which he tied near some water for some tigers which drank there. A bear came down, and seeing the buffalo went straight at it. The buffalo knocked him over with its horns, and the bear charged with the same result no less than three times. He then thought he had enough of it and went off, but he had scarcely gone 100 yards when he met a tiger coming down to drink. Colonel Mackenzie was unable to see what happened, but from the noise the bear made and the rush down the hill, he felt sure the bear received a good drubbing from the tiger. The tiger then came down to drink and was fired at and wounded but was not killed.

I once sat up for a bear which had been tracked in some hollow hills in the Panch Mahals. I was placed high up in a tree and the bear came out when it was just getting dark. I fired at him about 100 yards off and missed him, but the bear came straight at my tree and ran through some underwood beneath me and got away. The whiz of the bullet, I think, annoyed him. The Koina Valley, near Mahableshwar, is a great stronghold for bears, and will, I think, always remain so. The hills are covered with very dense undergrowth, and it is almost impossible to see the bears in a beat. I have often been after them there and killed but few, although over and over and again I heard the bear pass quite close to, but was unable to see it. On one occasion I got three bears in about five minutes. They came out of the beat all close to one another. I knocked over the first and wounded the second which turned and fought the third, I suppose under the belief that the third was the author of the pain produced by my bullet, and while thus engaged I killed them both. I have noticed that several sporting writers have observed wounded bears turn on their companions in a similar way.

The excellent photograph, which accompanies these notes, was taken by Captain F. T. Williams.

No. II.—THE RE-DISCOVERY OF *STRYCHNOS RHEEDII* (CLARKE).

In an extremely interesting article on the Serpent's Wood of the Portuguese which appeared at page 424 of Vol. VIII of your Journal, Dr. Dalgado drew attention to the mystery attaching to the species of strychnine which was figured by Rheede so long ago as 1688, and which had never been observed since.

It may interest him and others of your botanical readers to hear that this plant was identified by its fruit by the late Mr. M. A. Lawson, Government Botanist, when travelling with me in the Travancore forests at the end of 1893, and that I have lately obtained some fully-opened flowers.

Strychnos rheedii is an enormous climber, occurring in our evergreen forests at all elevations from the sea-level to 3,000 feet and stretching over the

highest trees. It is by no means uncommon. The leaves fall at the end of January, and the flowers appear in great quantities, together with the young leaves, early in February. The fruit does not ripen till the following year, and hangs on the branches for nearly twelve months.

The species of *Strychnos* are divided in the Flora Indica into groups according to the proportionate length of the corolla to the calyx. Rheede's figure of this species, judging by Clarke's description, shows a flower with a very short corolla tube and subglobose buds. This, as Clarke surmises, is wrong, unless indeed there is yet another species to be found in Malabar with large woody fruit.

The flowers of *S. rheedii* are cream-coloured, and borne in lateral cymes, terminating branchlets and many-flowered, the cymes being about one inch in diameter. The calyx is very short, $\frac{1}{16}$ th inch long and 5 cleft. The corolla tube is from $\frac{1}{3}$ to $\frac{1}{2}$ inch long, and the limb from $1\frac{1}{8}$ to $\frac{1}{6}$ inch. The style is slightly longer than the tube, and the stigma small and capitate. The fruit has a very thick shell and is from $2\frac{1}{2}$ to 5 inches in diameter, containing many seeds, similar to, but slightly smaller than, those of *S. nuxvomica*. The fruit, when ripe, is apple-green.

From this description it will be seen that *S. rheedii* (Clarke) is closely allied to *S. ceimamomifolia* (Thwaites), but it is specifically distinct, the lateral cymes and large woody fruit of the former especially distinguishing it.

It may seem curious that a large plant which is by no means uncommon should have escaped observation for two centuries. The explanation probably lies in the fact that this climber stretches over the highest trees, and that its flowers borne at a great height from the ground would easily escape notice. Add to this that the season of flowering is very short and probably does not last more than a fortnight, so that, unless any one happened to be collecting in the locality at the very time of flowering, no specimens could be obtained.

The lesson to be learned is that there is still a very wide field for botanical enquiry in the forests of the Western Coast.

T. F. BOURDILLON, F.L.S.

QUILON, 9th May, 1896.

No. III.—NOTES ON SHOOTING IN THE CENTRAL PROVINCES.

The following notes from my shooting diary taken this last winter, especially regarding weights and measurements of the tigers of the Central Provinces may interest some of the readers of the Journal. Our weighing machinery consisted of a circular-faced Salter's spring balance, indicating from 100 to 500 lbs., but the expansion of the spring was not checked in its case until it recorded 513 lbs., beyond which it could not move; besides this,

we had a smaller fisherman's spring balance weighing up to 50 lbs. The total weight which we could record was 563 lbs.

WEIGHTS AND MEASUREMENTS.

No.	Length of body.	Tail.	Girth.	Head.	Fore-arm.	Upper arm.	Weight.	Sex.
1	6' 1"	3' 0"	51½"	38½"	18¼"	23"	Over 513 lbs.	Male
2	5' 8"	2' 11"	...	...	...	...	486 lbs.	"
3	5' 8"	3' 0"	...	...	...	...	428 lbs.	"
4	6' 4"	2' 11"	56"	39"	20½"	...	Over 563 lbs.	"
5	6' 4½"	2' 10½"	...	...	...	...	448 lbs.	"
6	6' 1"	3' 1"	...	...	...	...	420 lbs.	"

All lengths were taken in a straight line from nose to end of tail.

No. 1 tiger was the first one we shot a day or two after getting on to our ground, and unfortunately I did not know where I had packed the 50-lbs. spring balance, so we did not get his true weight. The larger machine was right down to 513 and I calculated I put a lifting pressure of from 15 to 20 lbs. before it moved back. I should say he weighed full 525 to 530 lbs.

No. 2 was a very stout tiger, only 8'-7" long and 486 lbs. weight.

No. 4 was the most enormous tiger I ever saw, not in length, but bulk; she first took the big machine down to 513 lbs. I then hitched the 50-lbs. one into his mouth and took full 50 lbs. weight into that, still the big machine did not move, and we calculated he was 20 to 30 lbs. over the combined weights shown, which would make him fully 585 lbs. The heaviest tigress weighed 320 lbs. (length 8'-5"), and the lightest 268 lbs. (length 8'-0½"). I may add that I tested the weighing machines before starting, and on returning from our shooting trip, they were both right to within a pound.

The following case of a tiger swimming with a kill across a river is rather interesting :—

We had moved camp that morning, and in the evening I went out to look up the pugs of a tiger and tie-up for it. Passing a village about two miles from camp, the Gontra came running out and told me that their cattle had just been raided by a tiger who had killed two and mauled three more. They were just driving in the three wounded ones; these were clawed about the withers and neck, and one died within an hour. I went to the place where the two had been killed. They were lying about 200 yards apart just inside a patch of jungle, in a bend of the river. All round the bend the river was from 25 to 40 yards broad and varied in depth, from 5 to 10 feet or more. The patch of jungle in the bend was about 5 acres. Opposite one side of the bend the jungle continued up the bank of the river; on all other sides it was open cultivation. It was too late to do anything that evening, so I gave orders to report early if either kill was touched. Early next morning we were told

one of the kills had been moved, so we went to the place and followed up the drag. The jungle in the bend was an impossible place to beat, and we wanted, if the tiger was still there, to disturb him quietly and get him to cross into the other jungle; however, we found the kill had been taken down to the river and dropped over an overhanging bank about 7 feet high into 6 feet of water, and from where we stood we saw where it had been dragged out on the opposite bank. I do not suppose the tiger took a header in after the kill; he must have gone round and slipped into the water somewhere, swam up to the kill, taken hold and pulled it across. I did not look for his tracks as, knowing the kill was across, all was plain sailing. It was a very simple beat; the tiger came along nicely to my companion, posted on the right, but unfortunately, when he was about 100 yards away, he ran suddenly against a bear which gave him such a fright that he came galloping over to me, and I bagged him.

On the 7th February a friend who was with me shot a great solitary snipe, the first I had ever seen, and a few days afterwards I put up another. I was after a buffalo at the time and had no shot-gun with me, but the snipe passed within 6 feet of my head, and there was no mistaking it. It only flew about 50 yards, when I again put it up.

W. H. HUNTER, CAPTAIN.

NAGPUR, *June*, 1896.

NO. IV.—A CURIOUS MALFORMED TIGER'S SKULL.

Last hot weather I shot a medium-sized tiger, and on examining the head I found that both canine teeth in the upper jaw were missing. The right canine tooth had evidently become decayed, as there was a hole running right up into the root of the tooth. The place where the left canine tooth should have been was perfectly smooth and covered over with the gum. It looked as if the tiger had never grown this tooth at all. I thought no more of the matter at the time, and the skull has been put away with others ever since. Yesterday I took several tiger skulls out and put them to soak in cold water previous to cleaning them, and my attention was drawn to this skull. On examining it closely, I found a large canine tooth lying inside the cavity of the nose. I could only take it out with a great deal of difficulty, as it was well covered with thin bone. The tooth is a large one, but is deformed, and the point is worn rather fine, as if it had wasted away. The tooth had evidently been forced back through the socket and must have been in this state for some time, because the base of the tooth had become deformed. It must have originally been in its normal position in the jaw as it shows the enamel as in an ordinary tooth, and this also goes to prove that the injury took place after the animal was full grown. I may mention that in order to remove the tooth I had to extract it through the nose.

R. WAPSHARE, CAPTAIN, 3rd Lancers.

AURUNGABAD, *September*, 1896.

No. V.—NOTE ON THE SAME.

(With a Plate.)

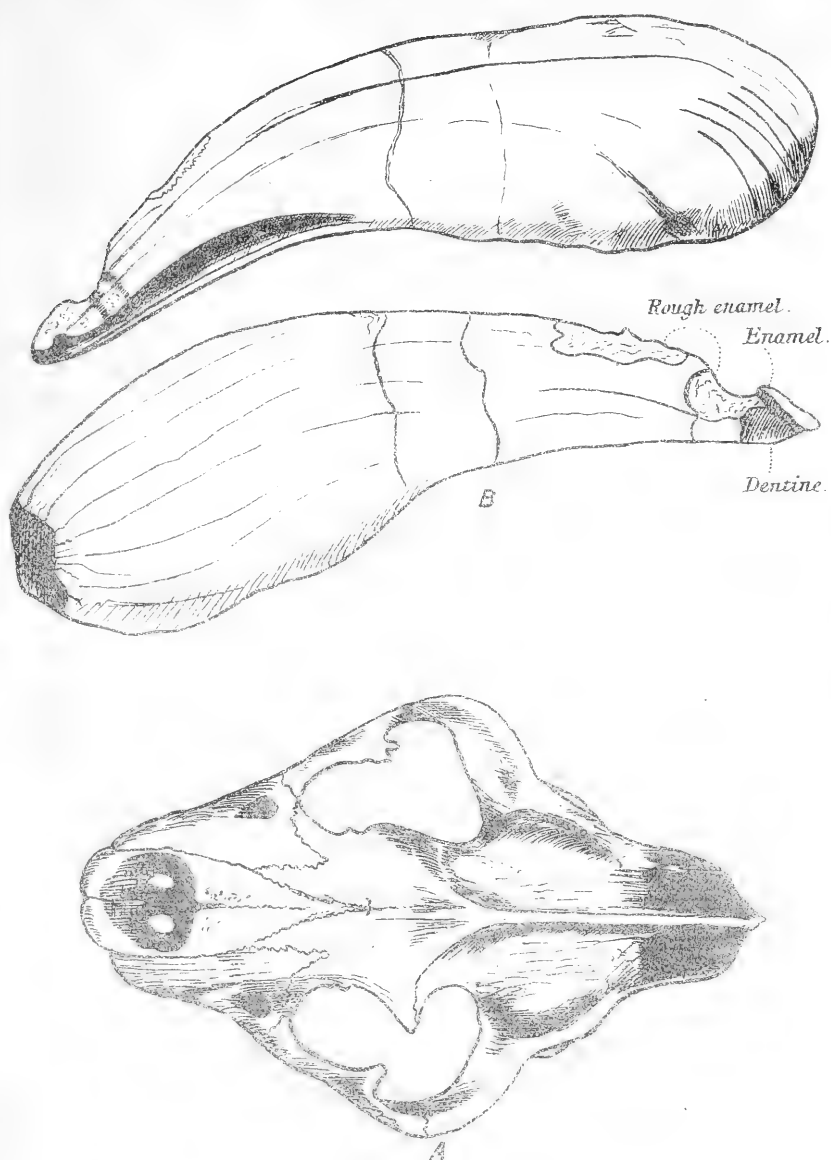
This skull, which was presented to the Bombay Natural History Society's Museum by Captain R. Wapshare who shot the animal in the Edlabad District, was handed over to me by Mr. Phipson to describe, it having been sent up on account of the extraordinary condition of the teeth. After studying it, one can only wonder at the animal having lived so long, for its life cannot have been a happy one, suffering as it must have done from frightful toothache, and the loss of part of its skull, besides being handicapped in its early adult life by having only one upper canine.

The skull is that of a well-grown male tiger; it has a peculiar lop-sided appearance; the usual convexity of the right maxilla over the root of the right canine is wanting, making that side of the face almost flat; the prominent supra-orbital angle of the frontal bone of the right side is absent; the surface of bone between its normal position and the lacrymal tubercle is rough and sclerosed, but part of the root is still present. The zygomatic process is short and has a secondary exostosis, and there has been an injury at the suture between the zygomatic and temporal bones.

Teeth.—The left upper canine is broken down level with the jaw from decay. The socket of the right is very small, and there is no appearance of the tooth from the mouth. The right upper canine has never been erupted, but is of normal size, being 11 c. m. long, and is contained in a groove in the right nasal forza, almost completely filling it up behind, where the base rests close to the ethmoid bone; the pointed extremity is abnormally directed downwards and a little backwards, being buried in the alveolus under the first præmolar; the lower and inner surface is free from bony support; the anterior part of the upper curve is overlapped by the inferior turbinated bone, the superior turbinated being pressed upwards. The tooth, therefore, must have grown backwards and inwards, and by pressure caused absorption of the inner walls of its cavity, being finally contained in a cyst and capable of a certain amount of movement which had caused the erosion and irregularities of the enamel near the point, immediately over which is the rudimentary first præmolar, not present on the other side.

I think the condition of the skull must have been caused by a severe injury received some long time previously, probably a bullet which had struck the frontal bone from above and a little behind, removing in its passage the frontal angle and on its way outstriking the zygomatic process. The encysted canine was due to the faulty position of the tooth during development, and probably the extra strain on the left canine caused it to decay prematurely.

P. W. BASSETT SMITH, R.N.



A. Tiger skull showing frontal deformity etc.

B. Right upper encysted canine. - Nat. size.

No. VI.—ON THE OCCURRENCE OF MARSHALL'S IORA
(*ÆGITHINA NIGRILUTEA*) IN CUTCH.

This bird is very fairly plentiful all the year round, but is less conspicuous during the months from September to May, owing to the fact that the male bird does not don his courting dress till the latter month. Still he may be heard calling occasionally during the hot weather, though it is not till June that his pleasant loud note makes itself heard everywhere. His principal calls sound something like: "Chee-tchoo-tchoo-tchee," sounding very loud and almost metallic, and "Chee-cho-chi-choo"—the former in common time, the latter in two-fourths, with the accent on the second syllable. Occasionally he bursts into a short song, the principal notes being of the "tchoo-tchoo" order, but he generally winds up with "Chee-tchoo-tchoo-tchee." When making love to his mate or wrangling as to the site for their nest, he often breaks into a chattering sort of note resembling so much that of the "Blue Titmouse" at home that I have often pulled up sharp and started, looking for one of the "*Ampelidæ*," apparently in the tree overhead. The male bird during the breeding season (June and July) is a resplendent creature. The top of his head is shiny coal black; the sides of the head, throat and upper breast of an intense gamboge colour, extending, though paler in colour, so as to form a sort of collar round the neck; this collar though, I believe, is rarely perfect. The wings are coal-black, with two conspicuous broad white bars. The upper back is also black, but less intense than that of the head, the feather showing yellowish just below the collar at the back of the neck and greenish-yellow towards the rump; there are two fluffy sets of greenish-white feathers in the axillaries; the lower parts, *i.e.*, the abdomen and vent, are of a paler yellow than the throat, cheeks, and breast, and some silky whitish feathers show about the sides and vent; the upper tail coverts and tail are glossy black like the head, but the tail feathers are broadly tipped and margined with pure white. The female is mealy-green above, with brown-green wings, white-banded and pale yellowish-green below. In fact, she much resembles the male "Siskin" at home. The eggs average 0.68" by 0.54", and are white in colour, with long streaks of lavender-grey and brown, forming a broad zone round many eggs. The nests are usually placed in a *Mimosa* of sorts—that species which has a gnarled sort of bark and twisted branches, with excrescences like oak-apples on them and short curved thorns like those on a rose-bush. I believe the *Mimosa* is that known in Hindustani as "Kheir," but not being a botanist I cannot say for certain. The nest is a shallow cup, rather broad for its depth, very neatly made of fibre with a few hairs inside and cobwebs outside. It somewhat resembles a minivet's nest, but is broader and less ornate, and equally hard to find. Occasionally, but rarely, the nest is built in a forked twig of the "pipal" (*Ficus religiosa*). I have only obtained one nest thus placed, and that, I feel sure, was that of a pair whose nest I had previously taken in a *Mimosa* tree close by. The birds frequent

low thorn jungle, rather open than otherwise, principally, but may be seen about the Bhuj Cantonments. The late Lieut. Barnes identified this bird for me in 1893 and asked me to send him some eggs, but I was at home in 1894, and before I could get any for him last year, he had passed away. He had always been most kind in identifying species and eggs for me and in giving me every assistance towards the completion of, or rather additions to, the "Birds of Cutch," which I hope shortly to send to the press.

C. D. LESTER, LIEUTENANT.

BHUI, CUTCH, August, 1896.

NO. VII.—A PLUCKY INSTANCE OF PANTHER-KILLING BY KATHIAWAR VILLAGERS.

My friend Mr. Harrison, of Dwarka, in Kathiawar, sends me the following account of the doing to death of a panther recently in the Okhamandal District :—

"An exciting and very pucky case of panther-killing occurred at the village of Nilwasa, a few miles from Dwarka, on 12th March. During the day the panther was seen to take shelter in a small stack of kirbi situated in an open *maidan*, a few hundred yards to the north of the village. A lot of Wagher tribesmen turned out armed with sticks and surrounded the stack, and after a good deal of bother the beast broke cover, and rushing round to the north side of the stack, flew at a Wagher who happened to be standing there, and seizing him by the throat brought him to the ground. The panther was at once attacked by other Waghers with sticks, and was made to release his hold before he had done any serious damage. He then turned and went for another Wagher who pluckily stood his ground and closed with the panther by seizing it round the body. The two then fell to the ground together. This kind of reception, combined with the shouting and yelling that proceeded from the other Waghers, was too much for the panther, and he released his hold and made tracks for the village, probably with a view to securing fresh shelter. A running fight was kept up for about 100 yards, and the brute was unable to evade the blows which his pursuers showered on him with their sticks. At this juncture one of the Waghers, without any regard for his own safety, seized hold of the panther's tail and held on like grim death, thereby retarding his progress. Meanwhile a comrade appeared on the scene, armed with a small axe, and rushing upon the panther dealt him his death-blow by splitting open his skull with it. I visited the scene of the *shikar* the following morning, and from the appearance of the ground, the tracks, and the Waghers' description of the fight I am convinced it is quite correct. The skin was brought to me and was that of a full-grown panther, 7 feet long."

These plucky villagers were rewarded by the Baroda Durbar, and no evil consequences resulted from the wounds and scratches they had received.

BARODA, April, 1896.

P. Z. COX, CAPTAIN.

NO. VIII.—NOTE ON THE DURATION OF THE PUPA STAGE IN
PAPILIO HECTOR.

The following note may interest some readers of the Journal :—

In August, 1895, I obtained on two or three consecutive days a large number—50-60 caterpillars—of *P. hector*, Linnaeus. There was not any appreciable difference in the duration of their lives as caterpillars, and they all changed to pupæ as soon as full grown. Though as larvæ they seemed exactly similar in every respect, yet the duration of the pupal stage in each varied so widely that of the original fifty pupæ—four still remained on March 1, 1896. Of these one came out damaged during the first week in March, two emerged in April, and one in May, the last three being perfect insects.

It is by no means settled what becomes of the butterflies at certain times of the year, or why some kinds appear in numbers one year and are rare the next. For instance, *Euploea kollari*, Felder, abounded last year in Karwar—though by no means a common insect—and this year, as far as I went, seemed to be a year for *Papilio nomius*, Esper. At all events I saw many and caught a few, whereas last year, though I was constantly in the jungle, I never saw the insect. What can be the causes which, as in the instance of *P. hector* I have described, shall delay or accelerate the metamorphoses of a certain number of larvæ which as larvæ appear in every way similar? Mine were fed on the same plant, were contemporaries in point of season, and lived in the same cage, in fact all the visible conditions of their existence seemed identical. It is, of course, a fact that the season of the year influences the metamorphoses of butterflies, the result being that the majority of each kind appear when their food is at its best; but it seems to me that, even granting this, the question is not disposed of. To illustrate :—*Euthalia laudabilis*, Swinhoe, feeds on a well-known evergreen which is apparently in the same condition as to edibility and nutritive power all the year round. I bred many of these insects last year, and observed that, while those bred in the early rains went through their changes with rapidity, a second and later consignment remained as larvæ nearly two months, and the pupal stage was nearly as prolonged. I am told by a learned friend that one was the quick and the other the slow brood, but (with deference) is not this another way of saying the same thing?

I have heard it said that some butterflies may remain dormant in the egg stage, but I do not think this hypothesis tenable for the reason that if the egg is fertilised before extrusion, then I cannot recall any other instance of delay in the developmental changes that take place in a fertilised ovum.

S. E. PRALL, SURGEON-CAPTAIN, I.M.S.

BOMBAY, September, 1896.

NO. IX.—FOOD OF THE BULL-FROG AND MUSK-RAT.

If the subject has not become stale, I can add some items to the food of the above-mentioned rapacious reptile and mammal.

Many years ago my eldest brother, while out for a walk, saw a bloated-looking bull-frog lying passive on the ground close to the path he was walking along. As he passed it, the creature did not move; so he struck at it and hit it with his walking-stick. The result was an explosion, and the reason of the frog's distended condition was revealed. He had swallowed a scorpion. The scorpion was evidently alive when swallowed, otherwise the frog would not have died. We put down the cause of death as "stings inflicted on the internal economy of the defunct frog." It is hardly necessary to add that the scorpion was dead too.

On another occasion I was returning home from a walk. My way led me past the back of the kitchen, on approaching which I became aware that something unusual was happening. An old hen who had a brood of very young chickens was cackling and fluttering about in a great state of excitement. I surmised that a cat, a jackal, a snake or some such depredating creature was the cause of her agitation. I approached with caution, so as not to scare away the four-legged creature, whatever it might be, or to get close enough to despatch the snake, if it turned out to be one. On getting up to the spot I saw nothing but an apparently harmless bull-frog. I was not then enlightened as to its proclivities. The frog was engaged in, what seemed to me, rather an unusual operation. He was pawing (if I may so explain it) his face about. This puzzled me until I got closer and then I saw what the wretch was doing. The legs of a chicken were sticking out of his jaws on one side, and he was trying to get them into his mouth. He departed this life suddenly, and the chicken was extracted from his jaws, limp and lifeless.

Another time I came across a bull-frog engaged in going through the same antics of pawing his face (*Experientia docet*). I went to the rescue of the chicken which, I presumed, he was making a meal of. It was not a chicken this time that I took from the jaws of that dead frog, but a young, though fully-fledged, specimen of the yellow-breasted ground thrush (*Pitta brachyura*). These three incidents occurred at Dapoli in the Southern Konkan.

With regard to the food of the smelly little beast called erroneously the "Musk-rat" (it being really a shrew), I can vouch for the fact that it attacks frogs, although I have never seen an instance of it attacking a bull-frog. My attention has frequently been attracted by the piteous cries or screams of a frog which has apparently been seized by a snake. On going to despatch the snake I have rescued the frog from the clutches, or rather teeth, of one of these shrews. Frogs emit similar melancholy screams when seized by snakes, and therefore it is advisable to go to the spot suitably armed with a tough bamboo, cane or stick in case the marauder turns out to be a snake. A lantern is a necessary adjunct at night on such occasions.

J. A. BETHAM.

DINAPORE, 28th May, 1896.

PROCEEDINGS

OF THE MEETING HELD ON 22ND SEPTEMBER, 1896.

A meeting of the members of this Society was held on Tuesday, 22nd September, at the Museum, Dr. D. Macdonald presiding.

NEW MEMBERS.

The election of the following new members was announced :—

Surgeon-Captain E. G. R. Whitcombe, I. M. S. (Jacobabad); Surgeon-Captain T. E. Dyson, I. M. S. (Surat); Lieutenant W. A. Light (Deesa); Mr. W. N. Porter (Pegu, Lower Burma); Mr. Jamsetjee, M. Doctor (Bombay); Surgeon-Major R. H. Nicholson, A. M. S. (Allahabad); Lieutenant C. F. Harold (Hyderabad, Sind); Surgeon-Major A. V. Anderson, I. M. S. (Nasik); Mr. R. P. Lambert (Godhra); Mr. Robert S. Imray (Peermaad, Travancore); Colonel W. J. Orr (Kurrachee); Mr. E. B. Thacker (Bombay); Mr. T. J. Spooner, C. E. (Dhola, Kathiawar); Lieutenant R. C. Bell (Agar, C. I.); Mr. H. Hodges (Upper Chindwin, Burmah); Mr. F. G. Steele (Sylhet); Surgeon-Lieutenant C. M. Mathew (Quilon); Lieutenant N. F. J. Wilson, R. I. M. (Bombay); Mr. W. P. Symonds, I. C. S. (Bombay); Surgeon-Colonel J. G. Pilcher (Darjeeling); Mr. S. H. Roffey (Mysore); Major E. V. Elwes, R. A. (Colaba); H. H. the Maharaja of Bhavnagar (Life Member); Lieutenant H. P. Ainslie (Chin Hills, Upper Burma); Lieutenant R. E. A. Hamilton (Bakloh); H. H. Aga Shah Rookh Shah (Poona); Lieutenant N. F. Unjacke (Bangalore); Lieutenant F. W. Saunders, R. E. (Secunderabad); Lieutenant C. Burrard (Bombay); Surgeon-Captain W. Carr Sprague, I.M.S. (Karwar); and Mr. G. Place (Akyab, Burma).

CONTRIBUTIONS TO THE SOCIETY.

The Honorary Secretary acknowledged the receipt of the following contributions to the Society's Museum since the last meeting :—

Contribution.	Description.	Contributor.
1 Spotted Owlet (alive) ...	<i>Athene brama</i> ...	Mr. H. Crawford.
1 Skin of Black crested Baza	<i>Baza lophotes</i> ...	Mr. F. D. Whiffin.
1 Leaf Insect (alive) ...	<i>Phyllium scythe</i> ...	Capt. Whitehead.
1 Mongoose (alive) ...	<i>Herpestes mungo</i> ...	Mr. H. MacNee.
Some Fossil Shells ...	From Burma ...	Mr. S. B. Bates.
A quantity of Marine specimens. ...	From the Persian Gulf ...	Dr. P. W. Bassett-Smith, R.N.
A number of Butterflies and Insects. ...	From the Central Provinces.	Surg.-Major C. O. Drury.
1 Skull of wild Dog...	<i>Cyon dukhunensis</i> ...	Mr. H. Godwin-Austin.
2 Skins of Layard's Fly-catcher ...	<i>Alseonax muttui</i> ...	Mr. A. L. Butler.
1 Koel (alive) ...	<i>Eudynamis honorata</i> ...	Mr. J. Barty.
1 Snake ...	<i>Tropidonotus beddomii</i> ...	Mr. N. B. Vakil.
1 Madagascar Tree Snake ...	<i>Dryophis</i> sp. ...	Mrs. G. Owen Dunn.
1 Lesser Grey Shrike (alive)	<i>Lanius minor</i> ...	Mr. W. D. Cumming.
1 Nubian or Pied Shrike ...	<i>Lanius nubicus</i> ...	Do.
1 Flying Squirrel (alive). ...	<i>Pteromys oral</i> ...	Mr. G. P. Millett.
1 Skin of the golden cat ...	<i>Felis temmincki</i> ...	Mr. A. J. A. Jardine.
1 Wood Shrike and nest ...	<i>Tephrodornis pondicerianus</i>	Lt. C. D. Lester.
A Number of beetles ...	From Ootacamund... ..	Mr. A. G. Cardew, I.C.S.

Contribution.	Description.	Contributor.
1 Snake (juv.)	<i>Tropidonotus plumbicolor</i> ...	Mr. A. M. Kinloch.
1 Short-toed eagle	<i>Circetus gallicus</i>	Do.
1 Black eagle... ..	<i>Ictinætus malayensis</i>	Do.
1 Scops owl	<i>Scops giu</i>	Mr. C. H. Ward.
1 Snake	<i>Dipsas trigonata</i>	Mr. W. Thacker.
1 Lemur (alive)	<i>Arctocebus calabarensis</i>	Mr. F. L. Wallace.
3 Eggs of white-backed Vulture... ..	<i>Gyps bengalensis</i>	Mr. Lovejoy.
1 Panther cub (alive)	<i>Felis pardus</i>	Mr. R. P. Lambert.
1 Phoorisa (alive)	<i>Echis carinata</i>	Lient. W. A. Light.
2 Oceanic Teal	<i>Querquedula gibberifrons</i> ...	Major F. Graham.
1 Snake	<i>Dipsas trigonata</i>	Lient. W. A. Light.
1 Black cobra (alive)	<i>Naia tripudians</i>	Do.
1 Phoorisa	<i>Echis carinata</i>	Surg.-Major G. H. S. Gimlette.
1 Tree Viper	<i>Trimeresurus anamallensis</i> .	Mr. E. H. Brock.
Nest and Eggs of the tailor bird... ..	<i>Orthotomus sutorius</i>	Lient. C. D. Lester.
1 Albino palm squirrel (alive)	<i>Sciurus palmarum</i>	Dr. J. Pollen, I.C.S.
1 Chameleon (alive)	<i>Chameleon calcaratus</i>	Lient. C. H. Roosmale Cocq.
2 Francolins (alive)... ..	From the Somali Coast	Col. W. J. Orr.
1 Spotted Himalayan Scops Owl... ..	<i>Scops spilocephalus</i>	Capt. R. H. Ratray.
1 Collared Pigmy Owl	<i>Glaucidium brodiei</i>	Do.
1 Red-headed Laughing Thrush	<i>Trochalopteryx erythrocephalus</i>	Do.
1 Snake (alive)	<i>Eryx johnii</i>	Mr. W. A. Light.
1 Skink (alive)	<i>Acanthodactylus micropholis</i>	Do.
1 Skink (alive)	<i>Ophiops microlepis</i>	Do.
1 Deegong's skull	<i>Halicore dugong</i>	Lient. A. J. Peile, R.A.
1 Cobra, juv. (alive)... ..	<i>Naia tripudians</i>	Mr. C. S. Spalding.
1 Phoorisa (alive)	<i>Echis carinata</i>	Mr. T. J. Spooner, C.E.
Nest, eggs and skins of Marshall's Iora... ..	<i>Ægithina nigrilutea</i>	Lient. C. D. Lester.
1 White-winged Black Tit... ..	<i>Parus nuchalis</i>	Do.
1 Snake	<i>Zamenis ventrimaculatus</i>	Mr. R. N. Coghlan.
1 Snake	<i>Dipsas trigonata</i>	Do.
1 Leaf Insect	<i>Phyllium scythe</i>	Mr. W. Mahon Daly.
1 Malabar Pied Hornbill	<i>Anthracoceros coronatus</i>	Mr. W. F. Biscoe.
1 Sand Snake (alive)	<i>Eryx johnii</i>	Lient W. A. Light.
1 Dhaman	<i>Zamenis mucosus</i>	Do.
1 Snake	<i>Zamenis diadema</i>	Do.
1 Krait	<i>Bungarus caeruleus</i>	Mr. F. A. Little.
3 Bats... ..	From the Himalayas	Mr. J. S. Gamble.
1 Cobra, juv. (alive)	<i>Naia tripudians</i>	Mr. A. M. Tod.
1 Lizard (alive)	<i>Hemidactylus triedrus</i>	Mr. C. McCarthy.
1 Cobra, juv. (alive)	<i>Naia tripudians</i>	Mr. J. Brown.
1 Python	<i>Python molurus</i>	Mr. E. S. Luard.
Some leaf insects (alive)	From the Seychelles Islands	Capt. Skinner (S.S. Scindia).
1 Snake (alive)	<i>Lycodon aulicus</i>	Surg.-Capt. J. Girvin.
2 Mongoose	<i>Barbus tor</i>	Mr. E. L. Barton.
1 Batelour Eagle (alive)	<i>Helotarsus ecaudatus</i>	Mr. C. Chambers.
3 Indian scarlet Minivets	<i>Pericrocotus speciosus</i>	Lient. H. Denholm Fraser, R.E.
A number of insects and Fossils.	From Kurrachee	Capt. E. R. Shopland.
1 Cobra, juv. (alive)... ..	<i>Naia tripudians</i>	Miss Benson, M.D.
1 Snake (alive)	<i>Dryophis mycterizans</i>	Lient. N. F. J. Wilson, R.I.M.

Contribution.	Description.	Contributor.
A quantity of beetles (alive)	Buprestidæ sp.	Mrs. G. S. Thomson.
1 Black Cobra (alive)	... Naia tripudians	Col. W. H. Lester.
1 Krait (alive) ... ..	... Bungarus caruleus... ..	Surg.-Capt. G. S. Thomson.
1 Krait (alive) ... ..	... Bungarus caruleus	Mr. W. A. Light.
Some shells ... ..	... Cypræa tigris and C. mauritiana	Capt. A. F. Finny, R.I.M.
1 Cobra ... ..	... Naia tripudians	Mr. R. Dyer.

MINOR CONTRIBUTIONS.

From Lieut. Cadell, Surgeon-Major Peacock, Mr. G. E. Howse, Captain Gwyn, Mr. Shilstone, Mr. E. E. Waller, Mr. S. P. Leggett, Captain Thorburn, Surgeon-Major R. H. Nicholson, Mr. J. P. Brand, Mrs. N. C. Pearson, Surgeon-Captain L. F. Childe, Mr. B. H. de Souza, Mr. W. A. Jones, Mrs. Thomson, Mr. P. Flower, Mr. J. Phillips, Mrs. Godfrey, Mrs. Bowen, Mr. F. Otto, Mrs. Rogers, Mr. Bapty, Miss B. Scott, Mr. J. Counsel, and Miss O. Lyons.

CONTRIBUTIONS TO THE LIBRARY.

The Irish Naturalist, Vol. V, Nos. 2 to 8, from Mr. W. F. Sinclair. The Victorian Naturalist, Vol. XII, Nos. 9 to 12, Vol. XIII, Nos. 1 to 4. Canadian Entomologist, XXVIII, Nos. 1 to 8. Agricultural Ledger, Nos. 1 to 22. Entomological Society of Ontario, 1895. Indian Forester, Vol. XXII, Nos. 1 to 8. Flora of British India, Part XXI. Records of the Geological Survey of India, Vol. XXIX, Parts 1, 2 and 3. Proceedings of the Zoological Society of London for 1895, Parts 1, 2 and 4, from Mr. W. F. Sinclair. The Journal of the Asiatic Society of Bengal, Vol. LXV, Part 2, Nos. 1 and 2. The Jack Rabbit of the United States. The North American Fauna, No. 11. Bulletin du Museum D'Histoire Naturelle, Paris, 1895, No. 7, and No. 1 of 1896. Transactions and Proceedings of the New Zealand Institute, Vol. XXVIII. Transactions of the Entomological Society of London, 1895. Illustrations of the Zoology of the R. I. M. surveying steamer "Investigator," Part II, Plates 4 and 5, Part III, Plates 9 to 16. Proceedings of the Linnean Society of New South Wales, Part 4, Vol. X, 1895; and Part 1 of Vol. XXI, 1896. The Proceedings and Transactions of the Nova Scotia Institute of Science, Vol. VIII. Proceedings of the California Academy of Science, Vol. V, Parts 1 and 2. Proceedings of the Academy of Natural Science of Philadelphia, Parts II and III, 1895. Annals of the Royal Botanic Gardens of Calcutta, Vols. V, VI, and VII. Statistical Atlas of India, 1895. Memoirs of the Geological Survey of India, Part 1, Vol. XXVII.

PAPERS READ.

The following papers were then read:—(1) Notes on Bombay Fishes, by P. W. Bassett-Smith, R.N. (2) A Rough Key to the Identification of Indian Ophidia, by A. G. Cardew, I.C.S. Miscellaneous Notes:—(a) Note on the duration of the pupa stage in *Papilio hector*, by Surgeon-Captain S. E. Prall, I.M.S. (b) Notes on shooting in the Central Provinces, by Captain W. H. Hunter. (c) A plucky instance of panther-killing by Kathiawar villagers, by

Captain P. Z. Cox. (*d*) Wounded animals carrying their broken limbs in their jaws, by R. H. Heath and Colonel F. H. Jackson. (*e*) The re-discovery of *Strychnos Rheedii* (Clarke), by T. F. Bourdillon, F.L.S. All these papers will appear in the Society's Journal, and a vote of thanks was passed to the Authors.

The Honorary Secretary drew the attention of members to an interesting exhibit sent by Surgeon-Major G. H. S. Gimlette, I.M.S., consisting of the left hind leg bones of a tiger, which had been smashed by a bullet some months before the animal was killed, and showing the natural process by which such injuries become cured. The broken bones are joined by an irregular mass of new bone, a great part of which would in time have become absorbed. The tiger was going quite sound on the leg when he was killed, the wound had long been healed, and beneath the skin was found a fragment of the express bullet which had smashed the bones.

Surgeon-Captain S. E. Prall made a few remarks on a tumour which he had removed from the lower jaw of a live Daboia (*Vipera russellii*) in the Society's Museum, and sections of the tumour were shown under a microscope.

Mr. R. C. Wroughton acknowledged with thanks having received collections of Scorpions from many members in response to his appeal. Some 20,000 measurements of scorpions had been made by him, and a large number of specimens forwarded for identification and classification to Mr. R. I. Pocock, of the British Museum, South Kensington, who will write a paper on the subject for the Society's Journal. Mr. Wroughton also drew attention to the sound-producing or stridulating organs in the Oriental Scorpions, and remarked on the curious manner in which these organs differed from those in African Scorpions.

Collections of scorpions had been received from Mr. R. H. Madon, East Khandeish; Mr. J. DuBoulay, I.C.S., from West Khandeish; Mr. W. Drew, I.C.S., from Ratnagiri; Mr. G. M. Ryan, from Sind; Mr. J. S. Battie, from Mangalore; Mr. E. P. Popert, from Madras; Mr. J. B. D. Adams, from Dharwar; Pandit Lachman Das, from Marwar; Mr. H. Bulkley, from Kharaghora; Surgeon-Major G. H. S. Gimlette, from Rewah, C.I.; Mr. James Martin, from Raipur, C. P.; Miss Spragge, from Mahabaleshwar and Poona; Messrs. Gamble and Smythies, from the North-West Himalayas; Mr. Tribhdas Metharam, from Hyderabad, Sind; Mr. A. M. Long, I.F.S., from the Garo Hills, Assam; Mr. A. D. Wilkins, from Satara; the Chief of Ichal, from Karanji; Mr. A. M. Caccia, from Mandla, C.P.; Surgeon-Lieutenant-Colonel A. Dane, from Bhopal, C.I.; Mr. H. V. Kemball, C.E., from Upper Sind; and Brigade-Surgeon-Lieutenant-Colonel R. Caldecott, from Indore, C.I.

The Honorary Secretary announced that the next number of the Journal (No. 3, Vol. X) was now being printed off and would be issued to members in a short time.

The meeting then terminated with a vote of thanks to the Chairman.

Bombay Natural History Society.

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EDITED BY
H. M. PHIPSON, C.M.Z.S.,
Honorary Secretary.

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*Containing Title Page, List of Members, Accounts for 1896,
Contents, List of Contributors, List of Plates,
Index to Vol. X, and Three Plates.*

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The Contents of this Number should be arranged as follows when Vol. X is being bound :—

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List of Contents	} To follow Accounts.
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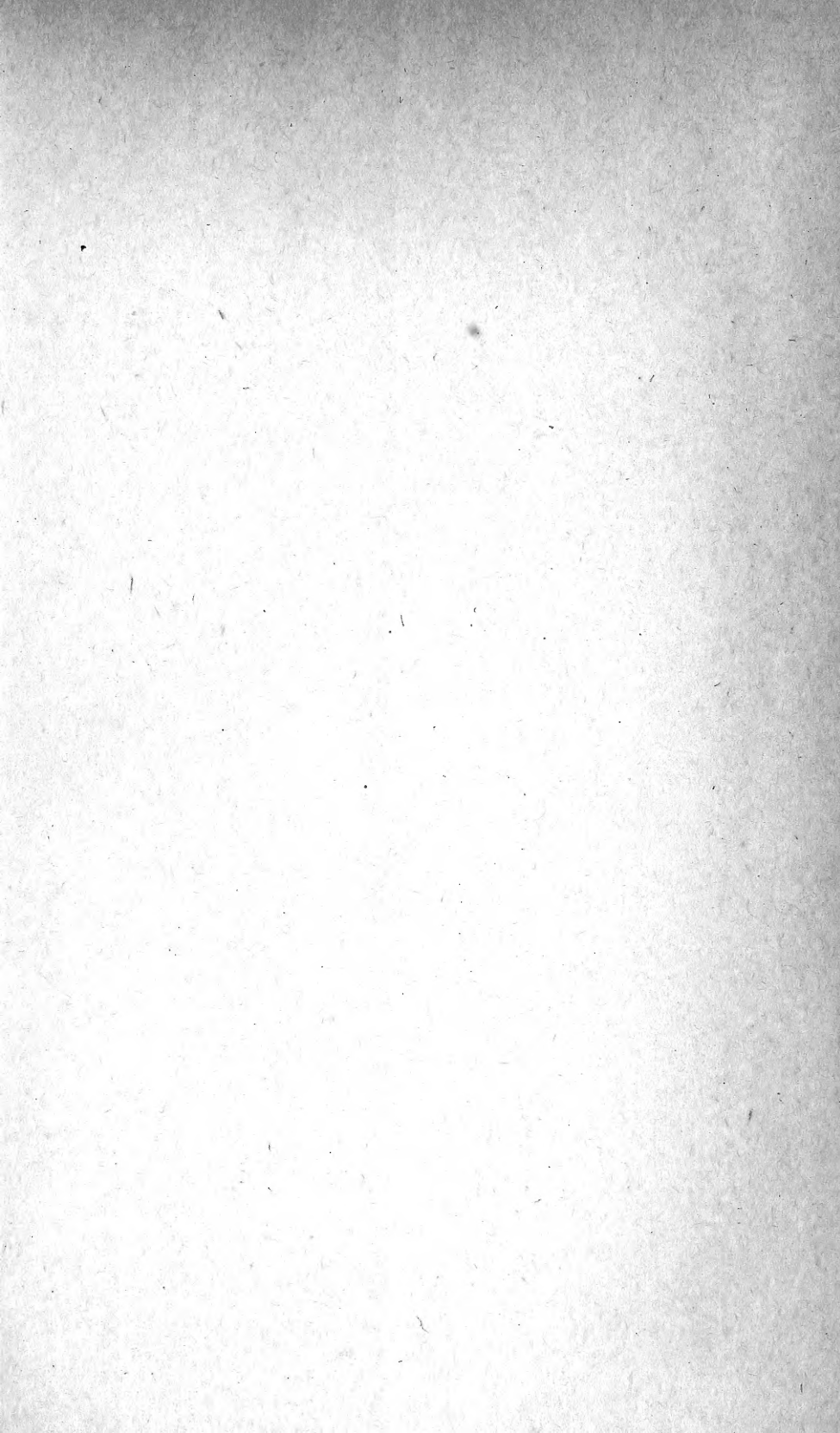
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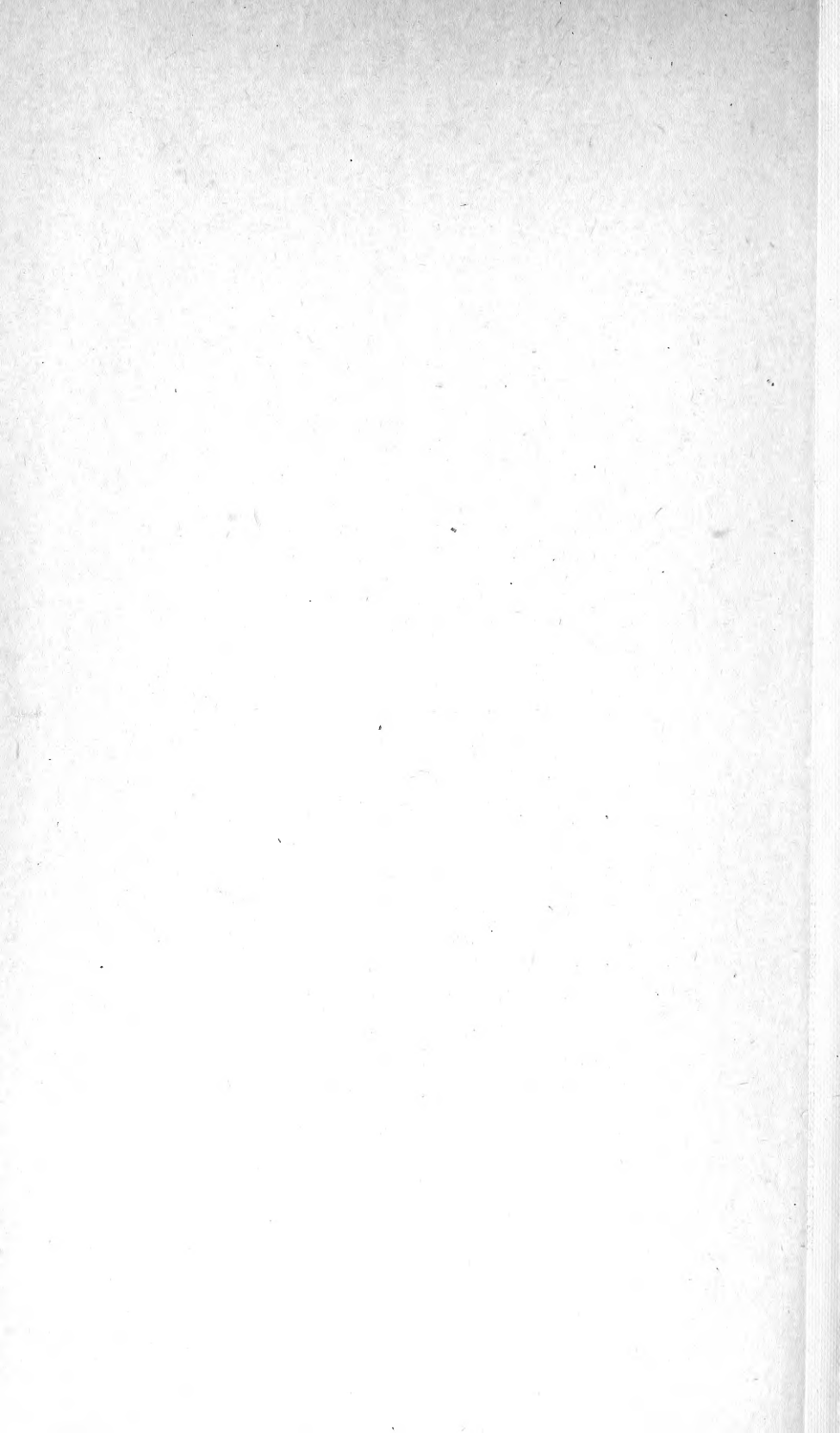
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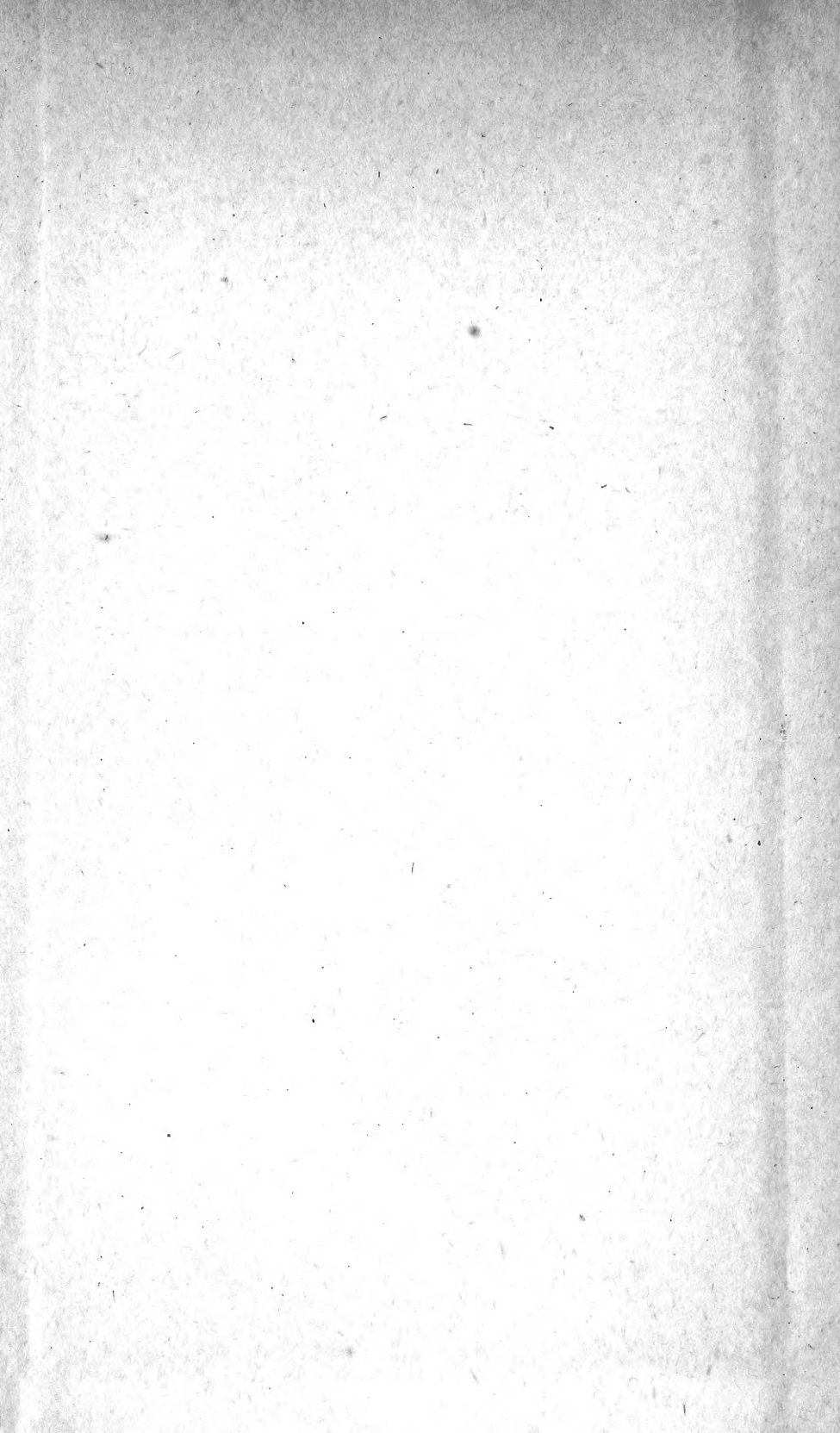
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